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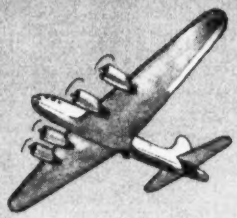

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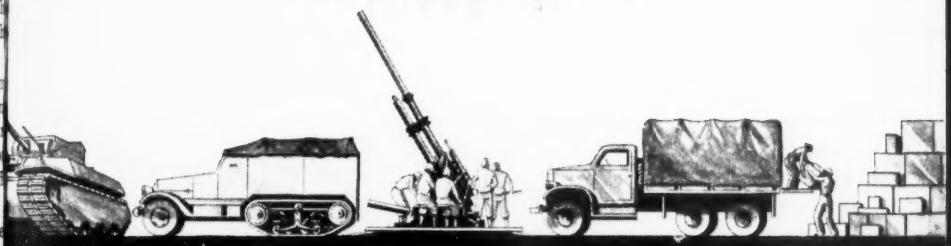

COMMAND AND GENERAL STAFF SCHOOL

FORT LEAVENWORTH, KANSAS

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A MONTHLY REVIEW OF MILITARY LITERATURE

XUM

WAR DEPARTMENT

THE CHIEF OF STAFF

WASHINGTON

Major General Karl Truesdell,
Commandant, Command & General Staff School,
Fort Leavenworth, Kansas.

Dear General Truesdell:

I am glad to see that the MILITARY REVIEW is publishing a number of accounts of battle experiences written by commanders and staff officers in overseas theaters. Lessons learned in recent campaigns are a valuable contribution to our present training program and will facilitate the revision of our Command and General Staff doctrine in the light of recent battle experience.

Many commanders and staff officers are having unusual and valuable experiences in battle. Whenever it is possible, it is my hope that these officers will make available to the Service as a whole this important information while it is still fresh in their minds.

The MILITARY REVIEW has been fortunate to receive in past months outstanding articles based on battle experience. I trust that in the months to come you may continue to receive similar articles, and that it will be possible to give them broad dissemination through their publication in the MILITARY REVIEW.

Faithfully yours,

Chief of Staff.

VOLUME XXIV FEBRUARY 1945 NUMBER 11

COMMAND AND GENERAL STAFF SCHOOL

MILITARY REVIEW

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Battle Experiences with a Regimental Headquarters in Normandy

LIEUTENANT COLONEL JOE E. GOLDEN
Executive Officer, 12th Infantry

Colonel Golden was with the 3d United States Infantry Division in Italy from the time it crossed the Volturno River until it reached the Germans' "winter line" at Mt. Rotundo. He is now serving as Executive Officer of the 12th Infantry Regiment of the 4th Infantry Division in France.—THE EDITOR.

THE 12th Infantry landed on the shore of France on D-day at H+240 minutes, and from that time until D+4 our regimental command post was continually under small-arms, machine-gun, artillery, and sometimes *Nebelwerfer* fire. An account of our early experiences and our later experiences may prove of interest and perhaps of tactical value to those units who may have to undergo similar combat conditions in the future.

Early in the landing operations our regiments were assigned extremely wide fronts, as much as 5,000 or 6,000 yards. This was necessary due to the fact that initially there were insufficient units to cover entirely every foot of the ground over the front. It was therefore necessary that each regiment drive ahead vigorously to seize key points, penetrating to the rear and to the flanks of the Germans and forcing them to withdraw or be enveloped and captured. Of necessity the flanks of the regiment were constantly exposed. Small enemy groups were often bypassed.

Initially, in the 12th Infantry's rapid and spectacular drive from the beachhead to Cherbourg, it was necessary, in order to maintain close communication with the assault battalions, that the regimental CP remain well up to the reserve battalion for protection from the enemy on the flanks. In such a position our regimental CP, as well as the front-line companies of the regiment, was frequently subjected to heavy enemy small-arms and artillery fire. Throughout this early period of operations, communications and control were maintained in a dependable fashion from regiment to battalion via SCR 608 and 609 radio supplemented by wire lines. Likewise the SCR 300 proved an excellent means of communication from the regimental to the battalion CP's, as well as from the battalion CP's to the various company CP's.

Our regiment landed with a minimum of equipment. Our tentage, which was supposed to have been landed on the evening of D-day, or D+1, was not forthcoming. Consequently, our first regimental CP was established in a French farmhouse. An operations room for S-2 and S-3 was designated and a separate room was set aside for S-1 and S-4. The message center and switchboard was established in adjacent farm buildings and sheds, and one room was set aside for the commanding officer and executive officer, where they could both work and rest. It was soon discovered that this method of requisitioning buildings for CP's proved extremely practicable in view of the fact that the French buildings themselves are generally constructed of stone or hard baked clay walls two to three feet thick which offer considerable protection against shell fragments as well as providing overhead cover. Further, the CP operated more efficiently in buildings than in tents, particularly during rainy weather.

Our vehicles were parked in nearby orchards and surrounding farm buildings which offered excellent cover and camouflage.

The first establishment proved so effective and desirable that our later CP's were likewise located in farm buildings. We now always move into buildings for our CP's. To date, we have never used our regimental CP tentage. We have grown more and more efficient in the operation and the selection of our CP's until at the present time we function as follows:

We constantly anticipate our next CP location.

A billeting detail composed of the head-

XUM

quarters company commandant, the communications officer, and necessary billeting personnel move ahead via jeep to reconnoiter and select suitable buildings for the CP. Buildings which are occupied are preferred since these offer less likelihood of mines and booby traps. These buildings are searched for mines and booby traps, cleaned and swept, and suitable rooms are set up for the use of the respective CP groups.

Wire lines are laid and the route forward is marked with road signs pointing the way.

When the time comes for the CP to move, the movement usually takes place by individual vehicles which can easily follow the marked route. Each CP section simply moves from one CP room to its respective room, when moving to the forward CP. There is no confusion. Telephone lines are already in place and the new CP can function immediately after movement takes place. A representative of S-2 and S-3 remains at the old CP until the new CP officially opens.

Vehicular traffic around each CP is kept to a minimum. Only the battalion commanders, executive officer, the regimental commanding officer, and colonels and generals may drive up to the CP building. All others are stopped 400 to 500 yards away and caused to dismount and walk to the CP. The vehicles are parked under cover in a motor park well away from the CP. This policy lessens the chance of the CP being detected by enemy aircraft.

The regimental CP is always selected in a rather inconspicuous location. It should never be placed near a prominent road junction or crossroad, in a village near a bridge, or in the vicinity of a church. These places should always be avoided since the enemy usually shells such locations with interdictory artillery fire. We also endeavor to find a building which has defilade from flat trajectory fire. Therefore, we look for CP locations in draws if possible.

Thus far we have been unusually successful. From our initial beachhead experiences we have found that a regimental CP which is continually under small-arms, mortar, and light artillery fire cannot operate at its maximum efficiency. Therefore, the CP is usually about a mile or more behind the front line. However, during the attack the regimental commander always keeps well forward at an advanced CP where he can exercise close command over his battalions and where he can visit personally, if necessary, the battalion which is making a principal effort.

Every effort is made to relieve the regimental commander of unnecessary burdensome details. When he goes forward, he takes with him a regimental party. This party is kept as small as possible in order not to focus enemy attention upon him. The regimental commander's party consists of the regimental commander himself, a lieutenant or captain orientation officer, an SCR 300 or SCR 609 with carriers and operators (either man must be able to operate a set in case one or the other is injured), and three or four other enlisted men. They go as far forward by jeep as is safe, whereupon they dismount and go on foot.

The job of the orientation officer is to keep the regimental CP in rear advised of the situation at the front, including any verbal orders which the regimental commander may issue. Whenever any information is desired of the regimental commander, the orientation officer usually furnishes that information.

The regimental commander only talks on the radio himself when he desires to talk personally to the battalion commanders or with his executive officer, S-3, or S-2, at the rear regimental CP. This system has worked excellently in this regiment with the result that (1) the regimental CP knows constantly what the situation is at the front. At the same time it is far enough back that the numerous administrative details of the CP can be efficiently performed without the annoyance of being shot at by enemy small-arms fire or close-in artillery or *Nebelwerfer* fires. (2) The regimental commander is relieved of all petty details of administration and radio communication. He is left free to devote his entire attentions to the tactical situation, which is as it should be. (3) He can move about freely without drawing par-

icular enemy attention upon himself and his arty, and when the day's operations are over e can return from the front to a well or- anized CP where he can rest and refresh imself for the following day's operations.

Early in our operations it was found that n several instances vehicles were lost by hav- ng taken the wrong routes forward in efforts o locate CP's. This regiment now has an fficient traffic system. The regimental MP latoon, comprised of one platoon of ap- roximately twenty men, now posts the regi- ental axis of signal communication and the ain supply route forward. In addition, with he assistance of our supporting engineers, oad signs have been made and our routes for- ard are marked even before they are used.

Furthermore, in order to eliminate mine asualties, a mine-sweeping team follows each f our assault battalions, sweeping for mines he respective battalion routes of supply and vacuation, and marking them with battalion ign markers. Each battalion furnishes a quad for protecting the mine-sweeping team gainst sniper fire. This system of marking outes in advance of their use and sweeping hem of mines has speeded up our supply nd evacuation and has resulted in prevent- ng the loss of both men and vehicles through etting lost and running onto mines. This ystem has since been adopted by other units, nd it works well for them also.

We sometimes wonder why there should be o much administrative detail in a regi- ental CP. It is apparent that there are any of these details after you have once orked around a regimental CP in combat. or example, the S-1 is continually working n citations and awards, for in combat there re many deeds of valor which must be of- icially recognized immediately. The recog- nition of these deeds is a most important duty nd is absolutely necessary in maintaining igh morale. Furthermore, the maintenance f the personnel records of the various units equires constant attention. The reception nd forwarding of the many replacements lso falls on the regimental S-1. In addition, he is burdened with the preparation and for- warding of his usual reports. Our regimental S-1 is a busy man. His duties require him to be up and awake off and on throughout the twenty-four hours of the day and night.

Our S-2 likewise is quite busy. He must prepare intelligence reports for submission to higher headquarters every four hours. In addition to this, he must prepare his portion of the unit report as well as keep the operations map up to date with the enemy situation. Further, he has the job of writing and maintaining up to date the regimental history. The preparation and recording of suitable notes and incidents in this regard requires continual attention. He must review prisoner-of-war reports; complete, evaluate, and disseminate information received; prepare overlays of known enemy dispositions; and plan patrolling operations for the coming night.

The S-2, among his other duties, is responsible for keeping any of the visiting members of the press advised of the current situation. He is responsible for providing them with whatever data they desire for publicity purposes within the limits of censorship. When the tactical situation permits, he also publishes a daily news sheet.

Our S-3 is one of the busiest men of our headquarters. Upon him falls the job of preparing drafts of all orders concerning the training, movement, and tactical employment of the regiment. Preparatory to drawing up these orders, the regimental commander, the executive officer, the S-3, and frequently the S-2 discuss certain details regarding the order, at which time the S-3 makes notes. After this preliminary discussion, S-3 draws up a draft of the order and submits it to the executive officer for approval. The executive officer makes any changes necessary on the draft and submits it to the regimental commander for final OK, after which it is published as an order. On some occasions when the regimental commander is well forward, he merely calls the executive officer and gives verbal directions for the preparation of certain orders. The orders are then drawn up and published in accordance with his directions, even though the regimental commander may still remain at the front.

Our regimental orders are generally brief

and to the point. It is SOP in this regiment that whenever any movement of any nature takes place, preliminary reconnaissance is made and guides and/or route markers are employed to insure that the various units arrive at the proper place at the proper time. The guide system is absolutely necessary, whether the movement involves marching on foot or motor movement, and more especially at night than in the daytime. Even though the foot or motor columns may become broken up or intermingled with personnel or vehicles of other units, our guides and markers point the right route for the various elements of the column, directing them on to the proper destination.

The S-3's duties include the preparation of his portion of the unit report. He also collaborates with the S-2 in writing the regimental history and checking on correctness of the data.

The S-3 together with the S-1 and executive officer in our regiment constitute a board which passes on all awards and decorations. Stress is made on the company and battalion commanders to submit all recommendations for awards and decorations immediately after the completion of an operation. This is usually done while the regiment is in a rest area. Mimeographed blank forms are furnished for this purpose in order to simplify the job of the recommending officer and in order that he can submit his recommendation for award in proper form. It has been apparent that many deserving men will be overlooked because their immediate commanding officers do not have on hand the paper or the necessary directions for writing up the award. Further, the award must be made while the details of the complete incident are still fresh in the mind of the recommending officer. The incidents of past battles soon fade with the entrance into battles anew. Our S-3, in addition to the duties enumerated above, keeps the S-3 map up to date at all times.

The S-4, in addition to his job of keeping the regiment supplied with all the necessities of combat, must recommend the regimental main supply route. Prior to recommending this route he discusses the feasibility of various possible routes with the S-3 and with our supporting engineer officer. Together they decide which is the best route from a tactical and engineering point of view. As our regiment moves forward, the assault battalions' engineer mine-sweeping team concerned clears this route of mines and marks it with the regimental main supply route signs. This system works well in this outfit. The regiment takes advantage of every opportunity presented in operations to resupply itself completely, and to fill any existing shortages. To date, we have kept well supplied with food, arms, ammunition, and equipment.

Emphasis is placed on feeding hot meals whenever the situation permits. In general, it has been found advisable whenever possible to keep our kitchen trains under battalion control in order that any particular battalion may have its rolls available and may feed a hot "B" ration (one "B" ration is carried on trains at all times). Ordinarily, during combat our assault battalions subsist on "C" or "K" rations. Usually it is impracticable to feed hot meals to the front-line troops during active combat, and the men then prefer "K" rations. At times, however, the reserve battalion can feed "B" rations and have its rolls issued out to the men. Of course, every effort is made to employ battalions equitably so as to give each battalion its fair share of time in reserve.

A comment regarding replacements. Replacements should seldom be sent up to a battalion which is actively engaged in combat. The result is usually that replacements become so frightened at enemy shell fire and small-arms fire that they become somewhat panicky. Naturally, they don't know who their squad or platoon leader or company commander is, and they become confused. In such a condition they are more of a liability than an asset. Under these conditions, particularly at night, they are apt to become frightened and are lost from their unit. Replacements should be given to a unit when it is not engaged, in order that each man may be properly assigned by squad, platoon, and company. The squad leader should have time to

learn a replacement's name by heart and assign him his particular job in the squad. Likewise, a platoon leader should have time to memorize each man's name, and the company commander to pick all of them up in the company records. Furthermore, if possible, the squad leader, platoon leader, and company commander should have time to drill each man with his squad for a short period. Each replacement, in turn, must learn to know his leaders and the members of his squad and his platoon, so that in combat he will recognize them and have confidence in them. This means a great deal to the new men. If this latter situation is possible and is carried out, the result will be that the new replacements will be much more helpful members of the fighting team than they would be otherwise.

The employment of our cannon company is worthy of note. From experience it has been found that an assault battalion commander has his hands full just fighting his battalion. When tanks are attached to him, he has an additional tactical burden on his shoulders. Why burden him still further by attaching elements of the cannon company to him? In this regiment we normally operate with a battalion of field artillery in support of the regiment. We maintain our cannon company likewise in support of the regiment, hooked up by wire with our supporting field artillery, using it to reinforce our artillery fires. By so doing we have an additional channel of communication for both the artillery and the cannon company and we can direct our fire to support either or both of our assault battalions wherever and whenever it is needed. If our artillery communications break down, we may still provide artillery support by using cannon company communications, and vice versa. This system has likewise been used with success in the case of supporting chemical mortar companies and supporting tank destroyer units (when the tank destroyers were employed as artillery). Furthermore, our battalion commanders wholeheartedly approve of this method of operation.

The executive officer supervises the functions of the various members of the regimental staff and does everything in his power to relieve the regimental commander from all administrative burdens. He sees to it that the regimental commander is able to devote his full time and thought to the tactical employment of his regiment. In our CP we endeavor to have a bed available for the regimental commander, so that when he comes back after a busy day at the front he can go to bed and rest up for the coming day's operation. Hot lemonade, hot chocolate, or hot coffee is on hand when he returns. A little stimulant of this nature is also provided the staff when they work all night long preparing plans and orders for the following day's operation. These details appear slight, but they improve the operating efficiency of the regimental headquarters and pay off in battle.

By virtue of the ingenuity of our communications personnel, we utilize our portable power generator, connecting with the wiring systems of the various French homes which we use as CP's, to provide electric lights. Our CP can function much more efficiently at night with a good electric light to work by. A black-out team covers all windows prior to darkness so that no light cracks show.

In our regiment it is SOP to maintain a liaison officer with the units to the right and left. We also have a third liaison officer who maintains personal contact with division headquarters at all times. Other units oftentimes maintain liaison with us. Accordingly, we set aside at each CP a liaison officer's room. Visiting liaison officers, representatives of the press, observers, and other visitors are directed to the liaison room where our liaison officers keep an up-to-date situation map and are always available to explain fully the current tactical situation. This system keeps a lot of people from milling around in the operations room and permits the S-3 and S-2 to devote their attention to the current tactical situation in some measure of peace and quiet.

Our experience with the employment of tanks has been that the ideal proportion of tanks in support of a battalion is one platoon plus a tankdozer. Our battalion commanders state that a full company of tanks gives them

too many tanks for profitable use by platoon. Communication between company commanders and tank commanders is ordinarily by word of mouth and pre-arranged hand signals. Communication between our battalion commander and the supporting tank commander is by personal contact and/or SCR 300 radio, one of which is loaned to the tank commander by the infantry regiment; or by means of a tank commander's radio mounted on a jeep back at the battalion CP. We are now using all three methods of communication. Next to the hand signals and direct contact, SCR 300 appears to be the best solution to this problem.

Our antitank guns are usually employed in depth to protect against enemy armor. To date, no enemy armored attacks in France have been received against this regiment. It is planned to employ these weapons well forward in order that they may be able to be used against enemy tanks which cruise close to the front lines, and against enemy gun positions. Our antitank guns have been employed on occasions with good effect to knock down houses in which the Germans were known to be located. A few rounds from our antitank guns into the house generally brought the Boche scampering out.

In regard to communications, various and sundry codes and ciphers are ever present in any operation, but in action during a fast moving situation, when the commanding officer or a staff officer wishes to talk to a battalion commander there is little time for enciphering and decoding messages. Therefore, we employ a most simple code which has proved to be effective. When our regimental attack orders or movement orders are issued, there is issued concurrently a number of coordinate points (crossroads, bridges, railroad crossings, etc.) which are labeled points A, B, C, X, Y, Z, or points 1, 2, 3, 9, 10, 11. Using them, we may talk freely over the radio referring to various and sundry positions with respect to these points. The enemy is none the wiser. To confuse the enemy further, we have code names for all commanding officers and staff officers. These names are changed at regular intervals. In order to be useful, any code must be simple. The above is simple and is easily understood by all.

It is hoped that these notes on battle experiences regarding staff functions in this regiment may be helpful to others. Naturally, the functions of each staff must be in accordance with the desires of the commanding officer, and must meet the circumstances of terrain and the enemy. The above related procedures have been tried and tested in Normandy against the Germans and have proved to be most efficient and satisfactory. Try them and see how they work for you.

Stress night survey: if they can do it at night, they can do it anytime. Night problems should be conducted with no light, and I mean no lights whatsoever. Take away every light instrument in the whole battalion except those to be used eventually in the CP. Training should be held in the selection and occupation of the OP's at night, and getting wire laid to them in the dark. There should be practice in occupation of difficult positions, the only kind we have had over here. Time after time, we have taken positions we would never have thought of in the States—positions that you look at at first and say, "That's impossible"; then you get to thinking, "Well, maybe it can be done"; and you end up by doing it.

—A field artillery officer with the Third Division in Italy.

Planning for Expansion of the Communications Zone

LIEUTENANT COLONEL WILLIAM H. KUNKELMANN, *Infantry*
Instructor, Command and General Staff School

FLEXIBILITY is an essential characteristic of the plans for any military operation. As the size of an operation increases, there is a tendency for this characteristic to decrease—sometimes even to the vanishing point. Loss of flexibility in the plan for a major operation can be prevented only when the plans of the major subordinate commands are flexible to a high degree.

Communications Zone plans must be drawn to meet all foreseeable contingencies and must be adaptable to meet those which cannot be foreseen. The tactical commanders plan their operations with the expectations of certain probable developments. However, no one can be positive of the exact results of any action, and the tactical command must be free to exploit to the utmost enemy weakness *whenever it may occur*. This tactical freedom of action is possible only when the Communications Zone can back up any and all successes with the supplies and services required for a continuous operation.

It follows that a number of different plans will be under consideration at the same time. Planning must be continuous and carried out concurrently within all echelons of the command. The formation of planning staffs within each headquarters is indicated. A planning staff is not intended to be a group of starry-eyed gentlemen who insulate themselves from the normal confusion of an operating headquarters, gaze into a crystal ball, and come up with all the answers. True, a planning group may be established with the members thereof relieved from all other duties, but they must keep themselves oriented constantly with respect to the current situation. Another, and more practical, method is to designate certain staff officers as members of the planning staff "in addition to their other duties." These individuals then spend a portion of each day working on current operations and a portion on future planning. The latter appears to be the better method since the staff is kept up-to-date by their regular activities.

Technique of planning will not vary appreciably from one operation to another except as determined by the experience of each headquarters. This discussion outlines certain features which should be included in any

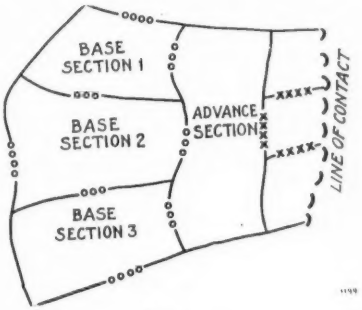


FIGURE 1.

such plan. The current situation in "X" Theater of Operations is shown in Figure 1. Three armies are in contact with the enemy. The Communications Zone has been organized into three Base Sections and one Advance Section. Each of the Base Sections is operating one or more ports of debarkation, and operation of all supply and evacuation installations has been decentralized to the various sections.

Theater Headquarters has just informed Communications Zone that it is anticipated that the line of contact will be advanced from 75 to 100 miles within the next 45 days, and the army rear boundary will then be established along the present line of contact. The armies will renew offensive 15 days after that. The Communications Zone is directed to plan to take over the additional territory indicated and to stock in the Advance Section eight days of supply and six units of fire to support this renewed offensive.

A decision relative to territorial organizations must be made immediately, since all other plans will be based upon this decision. Three proposed solutions are considered by the Communications Zone staff: (1) to ab-

sorb the additional territory in the present Advance Section; (2) same as (1) except that the forward boundaries of the Base Section will be advanced to decrease the total area of the new Advance Sections by increasing the size of each Base Section; and (3) to establish a new Advance Section in the area now occupied by the armies, to redesignate the present Advance Section as an Intermediate Section, and to leave the Base Sections undisturbed.

Proposed change (1) is rejected because the present Advance Section is already approaching unwieldy dimensions. This section is concerned with direct support of the combat troops and should not be overburdened with responsibilities of territorial administration. Proposed change (2) is likewise rejected. The mission of the Base Section is to receive supplies and personnel into the theater, keep the ports clear and operate the bulk of the supply and evacuation establishments in the theater. Once sufficient territory has been assigned to accomplish this mission, it would appear desirable to leave the Base Section undisturbed. Proposal (3) is recommended by the staff since it not only eliminates the objections to (1) and (2) but it further provides a relatively small Advance Section which may later be expanded

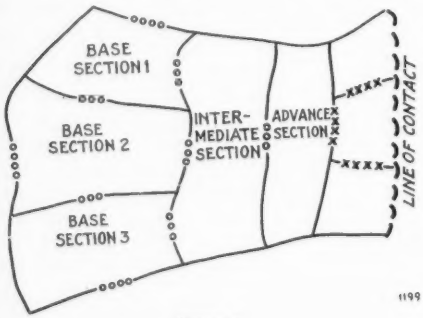


FIGURE 2.

without disturbing the rest of the Communications Zone. The proposed territorial organization is shown in Figure 2.

The establishment of a new Communications Zone section immediately brings up two personnel problems: the designation of a section commander and headquarters staff, and the selection of service units to operate the section. Since an expansion of this type is normal, it is probable that a skeleton staff for a new Communications Zone section will be available in the Communications Zone and that a commander will have been designated tentatively. Failing this a new headquarters will be constituted by assignment from the various operating headquarters.

In the situation under discussion, two possible assignments of the new headquarters are considered. They may be assigned to the new Advance Section, or the present Advance Section headquarters may be designated to operate the new Advance Section and the new commander and staff assigned to the new Intermediate Section. The latter alternative appears desirable. The present Advance Section has been in close contact with the combat organizations. A continuity of the personal relationships which have been established will contribute much to a smooth transition. Furthermore, any completely new organization requires some time to become a coordinated unit. It can take over an existing operation with less confusion than if required to establish an entirely new operation.

The recommended procedure in this case is to attach the new headquarters organization to the present Advance Section immediately and to direct the Advance Section to be prepared to take over the new Advance Section on the date indicated.

With regard to the assignment of service units, the Communications Zone staff should attempt no more than general plans initially. It is probable that a number of new units will be required and a tentative list may well be submitted to Theater Headquarters at this time, to be modified when estimates from the sections have been received. Service units are always at a premium; it is unlikely that new requirements will be available immediately; and some reassignment of units among the various sections possible will be required to provide sufficient personnel for the new Advance Section. The Com

munications Zone is the authority for reassignment, but an arbitrary redistribution is not desirable. The various section commanders including the new Intermediate Section should be requested to submit their requirements in view of the changing situation and any required redistribution should then be made on the basis of these estimates. An early conference of representatives of the sections relative to personnel matters should be scheduled.

The general supply plan of the Communications Zone must now be revised. The theater directive established a level of eight days of supply in the Advance Section. Proper echelonment of supplies in depth would indicate an increase in the number of days of supply to be stocked in the new Intermediate Section. This may result in a decrease of stocks in the Base Sections if the over-all level of the theater remains constant. The tempo of movement of supplies within the entire Communications Zone will accelerate sharply to provide for the supply build-up in both the Advance and Intermediate Sections.

An analysis of the capabilities of the transportation system may necessitate the establishment of priorities. Nothing must be permitted to interfere with the stock piling in the Advance Section and first priority would be assigned to these shipments. However it would be highly desirable for the new stock levels to be attained in all sections by the date of the renewed offensive. The Chief of Transportation and the Communications Zone Engineer will confer relative to repair or construction of transportation facilities if those currently in operation are unable to carry the increased loads. Analysis of the various types of transportation available and the relative difficulties of expanding each type will govern their ultimate recommendation. Emphasis should be placed on rail and pipe lines in the rear areas, thus releasing the bulk of the motor transportation for use in the forward areas.

The basic Communications Zone plan has thus far considered four important phases:

1. Change in sectional organization.
2. Method of assigning a headquarters and service units to the new Advance Section.
3. A revised Supply Plan.
4. A revised Transportation Plan.

These are fundamental considerations and probably will be worked out by the general staff sections of the planning staff and the Chief of Transportation. All staff sections, both general and special, will prepare their portions of the completed plan after the basic plan has been approved by the Commander. These sub-sections of the plan are by no means of minor importance: for example, the establishment of Communications Zone Signal Service for a new section certainly is a major operation. They will, however, follow the general pattern rather than determine it.

The plans of the several Communications Zone sections will cover in complete detail the operational phases of the plan as they apply to each section. Ideally, each section should be kept informed of the progress of the Communications Zone plan so that each section planning staff may work concurrently.

The three Base Sections' plans will be limited in this operation to covering an increased flow of supplies through the ports and a probable decrease in the total stock level carried in the Base Section depots. A loss of some operating personnel should be anticipated as stock levels decrease.

The Intermediate Section plan will involve expansion of supply installations to accommodate increased stocks, preferably by expansion of present installations rather than by establishment of new depots. An increase in the size of the medical installations is indicated. Here again, if the location of general hospitals has been chosen wisely, they may be expanded into hospital centers. Otherwise new locations for additional general hospitals will be selected.

By far the major part of the operational planning in this situation will be accomplished by the Advance Section, for this section has the mission of organizing and

operating all of the additional territory which is to be included in the Communications Zone. The advantages of assigning the old Advance Section headquarters to the new Advance Section are now apparent. The Advance Section commander probably will request that at least a part of the new Intermediate Section staff be assigned to his headquarters at the earliest practical date. As the personnel in this group work into their new assignments, a separate planning staff will be established in the Advance Section. The temporary formation of a separate planning group is believed justified in this situation because much of the time of this staff will be spent away from the headquarters on reconnaissance and at the headquarters of the combat elements, both ground and air. It might even be designated as a Forward Echelon of the Advance Section. The present basic policies of the Advance Section will be reviewed and changes made where necessary to conform to the projected situation. As with the Communications Zone as a whole, transportation facilities are a prime consideration. The capabilities of the network now in use by the Army must be analyzed and coordinated with all available information on lines of communication now in enemy hands. Analysis of transportation is placed first because the facts thus obtained will largely determine the location of the various types of Advance Section installations.

Each staff section will determine the number of each type of supply, maintenance, or evacuation installation which will be required. These installations will be located tentatively as the result of a map reconnaissance and knowledge of the current situation. A thorough ground reconnaissance of each proposed site should be made, and final recommendations then be submitted. The possibility of taking over present army installations and expanding them should be explored thoroughly before any new locations are considered. General depots, rather than branch depots, should be established in order to save overhead personnel. This part of the plan will be coordinated by G-4.

Again all staff sections will build their plans around basic transportation and supply plans. For example, the G-3 plan for protection will depend on the lines of communication to be operated and the location of installations.

The various section plans are submitted to Communications Zone headquarters and there consolidated. Adjustment will be made as required. The major problem then is one of personnel. The final list of new units requested is submitted to Theater Headquarters and arrangements made for redistribution of units within the Communications Zone.

Flexibility is insured by the preparation of alternate plans and by constant liaison with the combat forces throughout the entire operation. Flexibility in the plans for the entire Communications Zone depends largely on the planning in the Advance Section, since the other sections will still be operating from the same locations.

In the initial phases of a major campaign the Communications Zone should have many alternate plans. As the campaign progresses and immediate objectives become more apparent, the number of plans probably will decrease and adjustments to meet the tactical situation will be made by modification rather than change of plan. In any case it may be expected that all plans will follow a general pattern. The Communications Zone headquarters will prepare the basic plan based on the Theater directive and covering any organizational changes. The various Communications Zone sections will then prepare the detailed plans covering the operational phases. Both echelons will analyze the supply and transportation situation first and build the completed plan around these fundamental requirements. And finally, all plans must be drawn to provide for a smooth transition, a transition which will provide continuous support to the combat troops regardless of the changes which occur within the Communications Zone.

The Air-Infantry "Team"

LIEUTENANT COLONEL FRED L. WALKER, JR., *Infantry*

MUCH has been said and published about the dive bomber blasting the way for the fighting foot soldier on the ground. But the accounts of what the dive bomber *can* do and its actual performance in practice have often been two different stories.

It is time that we should take off our rose colored glasses and try to reconcile the publicized version of air support with the facts existing on the battlefield. Serious study is needed to determine what jobs the ground troops want done and how air support units can accomplish them better in practice under combat conditions.

Actually, scores of thousands of ground soldiers have been stopped "cold" for months at a time in Italy while, daily, hundreds of air sorties were flown unavailingly over their heads. The doughboy looked hopefully and with pride on the silver wings over his head, expecting miracles; but he soon learned that miracles were not for him and that when the planes were gone, the Jerry machine guns would still be there waiting to grind down on him like a buzz-saw the instant he showed himself or tried to move forward. One answer to this is that the dive bomber is capable of only limited assistance to the front-line infantry. The rest of the answer is that, in those comparatively few cases when close-in dive bombing can help and is of vital importance to the infantry, it must and only can be obtained by better methods than are now in vogue.

We talk constantly and write about "team work"; but team work is difficult—at times impossible—to attain between ground and air units with present loose methods of liaison. "Team work" means personal contact, personal and mutual confidence, personal interest, and rehearsal of team plays in advance. All the players have to be part of the team and actively in the game. The artillery knows this, and if air support units are expected to play the game, be a part of the team, and help the fighting foot soldier to reach the goal line, they must first take a lesson from artillery support methods. Close air support is nothing more nor less than long-range artillery; less accurate it is true, and more subject to errors of human frailty, but possessing very definite advantages under certain conditions.

There is army artillery, corps artillery, and division artillery, and there is artillery assigned on down to specific missions of supporting infantry regiments, battalions, and even companies. At times several batteries of artillery are shooting "like hell" just to help a platoon or sometimes even a squad of infantry to advance a few hundred yards; and if that squad or platoon does not get there, all the artillery in the world could not move forward an inch.

The significant thing is that out of this vast mass of artillery only a small portion is part of the "fighting teams": the infantry regimental and battalion combat teams. And only the few batteries which are part of each such team are normally permitted to fire missions within a thousand yards of the fighting infantry. This artillery is "part of the team": its battalion commander is at the headquarters of the supported regiment, it has liaison details at each infantry battalion headquarters, and it has forward observers right up with the front-line companies and platoons. The officers and men of this artillery have lived with, maneuvered with, and talked with the officers and men of the supported infantry. The personnel of both units have had "personal contact"; they have "personal and mutual confidence" in each other from previous association on firing problems and field exercises. They are interested in each other's welfare and would rather die than fail to perform their full part in each "play." So: we have team work.

When the infantry goes into action, they want "their artillery," and no one else, to support them: that is, to fire all the close-in missions within a few hundred yards of them. The great bulk of the artillery can shoot the more distant missions: harassment, inter-

diction, counterbattery in the enemy rear areas, or general support concentrations on distant hill tops; but only the direct support artillery are part of the fighting teams: part of the regimental combat team, part of the battalion combat team, with forward observers accompanying the leading rifle platoons.

These are the fighting teams of the infantry, from regiment on down to squad. These are the teams we "support" when we speak of "close support" of ground forces. Anything above regiment ceases to be a fighting team and becomes merely an organization for coordinating and apportioning jobs and equipment to smaller units. There is no such thing as "close support" of an army, corps, or even of a division, as far as the fighting ground soldier is concerned. Only when missions are assigned which directly assist regiments or smaller units does "close support" exist, either on the part of artillery or air units.

Air support of ground units is no more mysterious than this. There are strategic air units not immediately concerned with day-to-day support of ground operations; and there are air units required for day-to-day support missions called for by ground unit commanders; this last is the only part of the air force we are concerned with. This "ground support" air force, or whatever it might be called, performs programs of missions in general furtherance of the strategic plans of the army group, the army, the corps, and even at times the division. Here, then, lies the point: Let no one think that these missions are in direct support of the infantry fighting teams, from the regiment on down. No. They are most definitely "general support" missions, just as the fires of army and corps artillery are general support missions: counterbattery, interdiction, and harassment in the enemy rear areas. Close support of corps, army, and theater operations, yes, but close support to the doughboy and the regimental commander only because they are closer than Berlin or Tokyo. The air force as presently constituted has nothing to correspond to the "direct support" artillery of the ground forces.

Air support enthusiasts will say that under the present system of operation the dive bombers can and will fly effective close-in missions in direct support of front-line units but in practice they can not do so, as a general rule, and it is seldom attempted.

Reasons:

1. No Team Work. The air unit and its commander at their field fifty miles away or more, are not "part of the team."

2. No Personal Contact. Sure, there is an air liaison officer at division headquarters but he is really only a specialized communication agent for the use of the ground commander in requesting air missions. At best to a very limited degree, he represents the theater or army air support commander. He certainly in no way represents or even has an acquaintance with the commander of the air squadron flying the mission.

3. No Personal and Mutual Confidence. A rifleman is understandably squeamish about even his own machine guns shooting past him from several hundred yards away. He balks noticeably if any but "his own" direct support artillery battalion is shooting within six or eight hundred yards of him. And he positively shrinks from the prospect of a complete stranger "hunting and pecking" around him with one-ton bombs unless there has been a very definite meeting of the minds ahead of time. As a general rule the ground soldiers and their commanders in Italy did not want and hesitated to allow bombing and strafing missions under these conditions within two thousand yards of their front lines.

Moreover, the pilots know that the front line sometimes has not moved forward an inch on previous attacks in spite of all the bombing they could and did do, and that the same thing may well happen again. It is difficult for them to perceive the vital importance of any one mission as distinguished from the other routine missions they fly from day to day. The human element plays a large part in dive bombing, and the interest and determination of the pilot is bound to have some influence on accuracy.

4. No Personal Interest. The target may

be the key to the success of an entire division effort and the answer to life or death to hundreds or thousands of men, but to the pilot being briefed a hundred miles away it is just another routine mission to bomb a coordinate point on the map. Later when he is over the target, it is still just a spot on the ground, a vague spot somewhere among acres of vineyards, orange groves, and olive orchards. All he sees is a peaceful landscape pock-marked with shell holes here and there but otherwise devoid of any sign of military activity, either friendly or enemy. Where is the spirit of do or die when you can not see the target (which is camouflaged), you can not see any troops, and you do not even know whether your bombs hit fair or foul? Now, if there were something tangible to smash up, say, a battleship, and you knew that it *had* to be sunk. . . .

5. No Rehearsal Ahead of Time. The pilot does not know even the particular regiment or battalion he is risking his life to help. He has a general idea of the army plan of action, but none whatever of the detailed plan of the division or regiment he is supporting. He has seldom had a chance to study a good aerial photograph of the target area. He, of course, has had no opportunity to study the ground from an obervation post or from a previous reconnaissance flight. It may sometimes be that he has never flown a "close" support mission for ground troops before. In a word, he is neither part of the team, nor has he any idea of how the team play is to work, nor what the playing field looks like until he zooms over a hill at 400 miles an hour and suddenly sees it for the first time. He seldom knows where his mission will be until a few hours before he takes off; so he has no time to do these things, even if he were able.

So, no team work, with the result that few really helpful air missions are requested; and the results of these few are usually disappointing. The psychology of the average human being is such that ground units do not want and never will want a total stranger dropping bombs around their heads on the spur of the moment, so to speak, between more important missions to Berlin or elsewhere. There is a little more to it than that.

What can be done about this? Plenty. The remedy, after all, seems simple enough. Why not earmark and segregate a portion of the air force for close support of ground units and train them especially to perform close support missions and to understand the detailed operations and problems of ground troops? That is the first step: to get the job done, someone has to be primarily interested in it, and not just as a side line which they occasionally have to do.

Of this ground support air force a portion should be assigned during each major operation to direct supporting roles with front-line divisions and task forces making the principal efforts. Thus, an air squadron might be assigned the priority mission of directly supporting an infantry division during the period D—D plus 5. That is, on those days, that particular air squadron would fly missions requested by units of that division in preference to any missions requested by other units through the army air support command. Note, however, that any planes of the squadron not in action at any time are still available to fly supporting missions for other units, on call through air support headquarters. No planes are tied down or wasted by this procedure, *but* prompt air support is assured for the most important mission first during each critical phase of the action. Despite the newspapers, such has not always been the case in the past, under the present system.

There is no visible reason why this "direct support" squadron should not be made to feel "part of the team," just as each battalion of the field artillery in a division feels like part of its regimental combat team. The doughboys in a regiment call this artillery battalion which usually supports them "their" artillery, and they become greatly attached to it. When they go into action they want their artillery battalion and no one else to support them, and the artillery battalion after constant close association feels the same way about "their" infantry. This is a constant

and important factor in battle. It is the inescapable human factor of mutual trust and confidence which alone makes "team work" possible.

So this relationship must be built up between the air squadron and the infantry they are to support. If the mission of the division is important enough to assign it direct support aviation, it is important enough to be planned well ahead, two or three weeks; and it is important enough for the air squadron commander and his staff and key formation leaders to go to the infantry division and contact, personally, the division and regimental commanders and staffs. They should get a close look at the ground from front-line observation posts and pick out definitely the specific targets they may be called on to plaster. They should learn the routes, objectives, and times of movement of the front-line infantry units; and they should learn clearly their part of the team mission and how it fits in with the tank, artillery, and infantry plan. These officers should carry back to their pilots maps and aerial photographs showing all these details for study and orientation of pilots well ahead of time. The squadron leader or his representative should establish quarters at the division commander's headquarters, and one or the other should be present there during the week preceding and during the action itself. The squadron commander would probably want and should definitely have his own observers at one or more of the forward ground observation posts for first-hand information on the results of each mission, for this air squadron will have definite, tangible missions. It will not be ordered to fly so many sorties against a certain impersonal area. Instead, it will be requested to "Destroy the stone buildings at ————" or to "Prevent normal traffic from moving on route so-and-so between H hour and H plus two" or to "Blow up the important bridge at ————." In other words, we have gotten away from the old idea of rigidly flying so many sorties and then stopping regardless of results until another air mission can be requested for the next day. We no longer care about the tabulation of bomb tonnage or the number of sorties flown. The mission is vital, and results are all that count. It is the army or corps main effort and *must* go through, and everyone keeps plugging with everything he has until it does. We will lay down a priority list of air missions during each phase of the attack, and we will fly and fly and fly until each mission is successfully completed or until the battle is over.

Sure, we will lose planes, lots of them sometimes. Just as we will lose and have been losing thousands of ground officers and men, and scores of tanks. That is why we reserve such usage of air units for vital efforts where they can really be of substantial assistance.

This system will give us "team work." By personal contact well ahead, and by rehearsal of the maneuver (on the map, at least) with the air unit participating, the air unit becomes an active, trusted, member of the team and of the several smaller teams which they are to support. The squadron commander and his staff and pilots are "in on the play." They know every bush, house, and shell crater in the enemy's position, and they know where our rifle troops are going to be from time to time, where the enemy is, exactly how and why each air mission will assist the infantry attack, and what the results of each mission are as soon as it is completed. The infantry commanders know the air commander and staff, and perhaps some of the pilots, and trust them accordingly. Furthermore the presence of the air unit commander or his representative at the ground unit headquarters guarantees top performance and dependable results.

Finally, all these factors contribute to personal interest of the pilots and their commanders in pushing each play through successfully. They know that their missions are vital and that they are not wasting plane hours and risking their lives merely to satisfy some whim and add a bit of colorful racket to the din of battle. They will take great pride in the successes of ground units they support because they will know that they have had a big and definite share in each one.

QM Supply at Anzio and the Italian Theater

MAJOR GENERAL E. B. GREGORY
The Quartermaster General

IN September 1943, a new division moved in to join the American Fifth Army in Italy, landing with twenty-two 2½-ton truckloads of reserve Class II and IV supplies alone. Never having fought with the Fifth, it came in with the assumption that the Fifth's Quartermaster was either of the old school that said "No" at every opportunity or that the supplies could not be delivered right to the front lines. But it learned quickly that it was unnecessary to hoard supplies and burden the division with dead stock to be transported with every move. Today, this division moves its QM supplies in ten trucks or less because it has the Fifth's supply confidence—that when the Quartermaster hasn't got it he can provide an adequate substitute, and at once.

This confidence wasn't born overnight but was created as weeks of combat stretched into months without the QM's letting the troops down once. Despite difficulties encountered, the supply services met their many needs with a minimum of time and red tape. If terrain prevented use of vehicles, supplies went in by packmule and packboard; at Anzio, there was always fresh bread to supplement packaged rations or shortages when weather prevented unloading. If additional clothing and other II and IV supplies were needed, these too were provided.

From the first amphibious landings up to the establishment of railheads in the present battle areas, the Italian theater has offered supply problems for which there were no precedents. Confined to a small area over a long period of time, the Anzio-Nettuno operations were the toughest the QM units had yet encountered or may reasonably expect to meet. The landing itself was relatively simple except for the bombings which were not long arriving. Little damage was suffered in getting ashore that first day; that came later when the enemy began to concentrate his artillery and air power on the narrow beach area. During the first sixty days ashore, the service troops lost nearly ten percent of their personnel, considered high even by assault troops.

The assault waves took off from the ships at 0200, followed at 0300 by the service troops whose job was to set up and operate, twenty-four hours a day, all kinds of dumps. While a few of the QM troops were veterans of the bitter action at Salerno, for the most part it was the first time most of them had been

NAPLES AREA, ITALY.—OPENING A VALVE FOR FUEL TO BE DISCHARGED THROUGH LINE FROM SHIP TANKER TO STORAGE TANKS. (SIGNAL CORPS PHOTO.)

under actual bombardment. On the whole, they stood up well and established temporary dumps for all types of supply. Supplies had to be drawn from these until the third day when the QM units succeeded in setting up the first of its permanent dumps.

Selection of a dump site is always important but in this case it was doubly so since the beachhead was in the region of the Pontinian marshes. A well-drained location was discovered on a hillside which also offered reasonably adequate dispersal. Although under direct bombardment much of the time, it issued rations to all the American troops until the army broke out of the area many weeks later.

All rations were received by water, either by LST's or Liberties, which meant that subsistence during the early days of the action

was largely dependent upon weather and unloading conditions. There would be a couple of days' good weather and then an equal amount or more of bad, the bad weather necessitating issue of rations from the meager stocks from previous receipts which had been saved in an attempt to build up a reserve. This called for plain horse sense and ingenuity in breaking down the available supplies and balancing rations that were never intended to be balanced. Regardless of the ration type dictated by the necessity of the moment, freshly baked bread was issued with any and all rations.

The baking equipment was set up in an olive grove and use of netting concealed it fairly well from enemy air observation, but due to the local and concentrated nature of the operation, the bakery came in for a full share of shell and bomb fire. On its first night in the area, all fifteen ovens were punctured, mixer motor damaged, and flour and other ingredients filled with small pieces of shrapnel as the result of a general air raid. Materials were sifted and repairs effected by the personnel of the platoon who kept the bakery at almost peak production. Spare parts were acquired from salvaged equipment while others were improvised and tooled from scrap metal. Troops back from the front lines for a brief rest would watch with respect as helmeted Quartermaster bakers worked on hour after hour, stopping operations only during the heaviest shelling or air raids.

As the striking forces advance, extension of the supply lines by moving up the railheads or truckheads is a sizeable job in itself. Prior to Anzio and the break-out there, the Fifth's railheads had adopted the leapfrog method of moving up, operating by platoons. The platoon in the rear moves up enough personnel to open a new dump, leaving enough behind to close up the old one as the supplies are depleted by requisitions from the front. In the meantime, the new dump is accumulating fresh stocks from the base depots.

Processing at the railheads must be fast and *accurate*. In handling "B" rations especially, the tally-in must be checked against the shipping ticket to determine if all components have been shipped in the required quantity. If some item has been short-shipped, the issue factor should be reduced so as to pro-rate the item unless existing stocks are sufficient to permit the shortage to be made up by substitution. Generally speaking, however, it is seldom advisable to unbalance one item of stock to balance another.

Experience has emphasized the importance of keeping a record of the trend of Average Daily Issue Strength, based on the daily telegram and the dump reports and showing three classifications—Up, Down, and Constant. Knowing the trend, future demands can be better anticipated. Also, close contact maintained with division Class I officers, unit S-4's, and the ration sergeants of the units served pays off in the form of enabling the railhead to be better prepared to meet future demands.

Classes II and IV include virtually everything in the way of equipage that keeps the men in the front lines. Under the T/O's, this type of dump is set up for the maintenance of items already in the hands of the troops. But from the beginning, the Anzio II and IV dumps operated as semi-replacement depots as well as maintenance dumps. The Anzio operation supplied the final proof as to the feasibility of a plan eventually incorporated into the recently approved T/E 21—that is, the plan which sends troops into the combat areas with clothing and equipage skinned down to what they wear and can carry in their pack. It is then up to the Quartermaster to provide them with whatever they need from there on in.

It was a thorough test. Arrival of rear echelons were delayed and the depot supply detachment was shelled out on one occasion and bombed out on another, requiring removal each time to a new site. But, literally speaking, the supply units kept one jump ahead of demand. Clothing and equipage were damaged or worn out, requiring constant maintenance and replacement; items not carried onto the beachhead with the assault forces were needed when they dug in—and

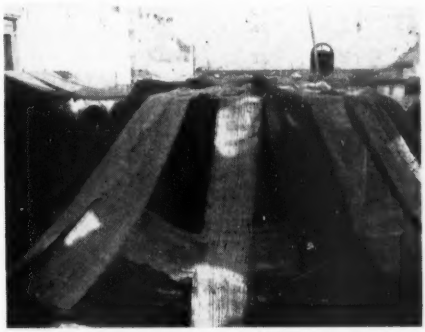
were supplied. For instance, one unit needed a field range, another required several thousand pairs of heavy socks, and still another, hundreds of intrenching tools.

A similar situation in the Salerno area previous to the Anzio operation was somewhat more difficult to handle because of the unusual volume required. Shoes wore out in as little as nine days, and in less than two weeks after the initial landing the 3d and 45th Infantry Divisions as well as the 82d Airborne were sending in urgent requests for shoes and socks; these were brought in by plane. Then the worst weather suffered by the region in years set in—alternate rain and snow, mud and ice, requiring immediately more than a half million items of heavier clothing and over 100,000 each of raincoats, blankets, and shelter halves in addition to picks and shovels for opening drains in liberated cities and towns.

Virtually all of this additional supply had to be brought from stocks in North Africa which had been accumulated for just such emergencies. This storage of reserves had offered its own problem, for even in Africa suitable storage facilities were hard to find. The few that had existed at Oran and other points were exhausted immediately with the arrival of the Allied forces. The Mediterranean Base Section Quartermaster obtained whatever suitable structure he could, including garages, wineries, and cooperages, but as late as August 1943 the available closed storage space amounted to less than one and a half million square feet as compared with twenty-two and a half million square feet of open dump space.

One of the most serious problems of the Italian or any theater is the operation of a Class III dump. Its inflammable nature, as well as its importance, makes it a prime target for enemy attack. Bombing or strafing, the method is of little consequence since every successful foray brings about the desired result of starting the blaze. Once the gasoline ignites, it is difficult to bring a gasoline fire under control or prevent its spread unless greatest care has been exercised in laying out the dump site. At Anzio, the smallness of the area as well as the lack of cover made the Class III dumps especially vulnerable. Many protective measures evolved from necessity in Italy will prove invaluable in future operations in any theater

Incendiary bombs will always ignite a stack of gasoline when dropped on it, but high-explosive bombs will usually ignite a POL dump [petroleum, oil, lubricants] from a distance of twenty to twenty-five feet. In the case of personnel bombs, lone missiles seldom set a blaze, but on the other hand, single bombs are unusual, these being usually dropped in clusters. This applies to artillery bombard-



PALERMO, SICILY.—ONE-HUNDRED OCTANE STORAGE TANK IN A WELL, CAMOUFLAGED IN PATIO OF A BOMBED BUILDING. (ARMY PICTORIAL SERVICE.)

ment as well. The explanation, of course, is that the first explosion seldom does more than perforate the cans or drums while the succeeding shells or bombs ignite the vapor and gasoline released by the first explosion.

It goes without saying that the first requisite is adequate dispersal, but in the face of constant air and artillery attacks such as those suffered by the gasoline supply company at Anzio, dispersal is not enough. No more than 5,000 gallons should be placed in each stack when in danger of aerial or artillery fire. Additional precautions must be taken, such as burying the stacks in the earth or throwing up a four-foot wall of dirt about them; both methods were signally effective at Anzio.

Where rainfall is relatively light, a sandy

soil may be found preferable since this is conducive to easy construction of a protective wall; also, a man, a shovel, and plenty of sand forms an effective fire-fighting combination. The wall provides protection against shell and bomb fragments and usually only a direct hit does much damage. Such a wall causes an ignited stack to burn more slowly, and by keeping no more than 5,000 gallons in any one stack the fire is more easily put out and many times will not spread. Another method is to bulldoze a hole sufficiently deep to stack 5,000 gallons beneath the surface; a runway may be scraped to enable the trucks to back down to the stack. This gives the same protection as the wall, perhaps better, and saves labor since the same hole may be used over and over again.

Transportation offered a paramount problem in some areas and required a combination of motor, mule, and packboard. Jeeps were the regimental standbys but in some areas could proceed no farther than the battalion supply points. Then it was up to the mule and brawny shoulders. The Italians as a rule were willing to sell their animals, but there just weren't enough to meet the needs and in some areas the Germans had conducted systematic slaughter to prevent them falling into Allied hands. Packboards kept the supplies flowing to the front lines in the more mountainous areas and sometimes enabled the delivery of hot rations and hot water. Cans of "C" rations were heated in boiling water, placed in 155-mm shell cases, strapped three to a packboard; hot water was sent forward in five-gallon cans wrapped in blankets. Troops at some isolated points were supplied by light Cub planes, each of which could carry and drop up to 100 pounds, the equivalent of two five-gallon cans of water or two bundles each containing seventy-two "C" rations. Equipped with bomb releases and flying at 400 feet, the packages could usually be dropped within twenty-five feet of the spot indicated.

Apart from supply, the army Quartermaster was confronted with a different problem—prevention of typhus and other diseases in a fever-ridden country. Mobile fumigation and bath units were moved in from Sicily and Africa as soon as possible and sent up to the forward troops. These were operated in connection with the clothing and equipment exchange system now in use. Briefly, the system is this: The men simply turn in what is damaged or too dirty for wear and receive clean, whole items in exchange with no questions asked; the old ones are cleaned, repaired if necessary, and returned to stock for re-issue.

Back of the advance areas was another job that had to be done without delay. Clothing and other material recovered from battle areas were piling up in the sheds of the salvage collecting companies; some was new, some old, and all of it dirty, smelly, damp and mildewed, offering excellent places for breeding and development of the body louse, spreader of disease. One sterilization company was retained in the rear area and by working around the clock, seven or eight tons a day, the company eventually eliminated the backlog of material for the laundries.

Never before has an American army been so closely supported on its offensive operations by such complete Quartermaster supply and services. So far, the conflict has taken the American soldier to nearly every latitude of the globe but no matter what new problems and conditions the future may bring, we know we can meet and overcome them with the confidence born of experience.

A common consequence of lack of moral courage is the tendency to pass to others the blame or responsibility which the leader should bear himself. Such moral cowardice naturally destroys all respect for the leader.

—Major General Costello in *An Cosantóir*.

Sanitary Problems of a Tropical Advanced Base

Digested at the Command and General Staff School from an article by Captain Lucius W. Johnson, Medical Corps, U. S. Navy, in *The Military Surgeon* June 1944.

THIS is the sanitary history of a tropical naval base that, in the space of six months, grew from a few scattered groups that were of no sanitary importance to each other, to be a closely settled industrial community of about fifty thousand men. It progressed through all the stages of development that one of our frontier cities would undergo in several generations—from the arrival of the pioneers in their covered wagons, until it became a bustling industrial center. As the Pacific combat area moves toward Tokyo, each newly-won base will go through these same growing pains. Perhaps a recital of the experiences of those who have been through the mill may benefit others who will face similar problems in the future, for this can happen to any naval medical officer.

There is a common saying in the advertising world that, no matter how good your stuff is, if you can not sell it, it is worthless. This applies also to public-health work. At a certain stage in every public-health campaign, there comes a time when salesmanship is more important than scientific knowledge. No matter how thoroughly we may understand sanitary principles, however clearly we may visualize the steps necessary to correct sanitary defects, our knowledge is useless unless we can present our thesis in an understandable manner to those in command, and secure their endorsement. This often required a great deal of thought and planning, and, if the subject is not clearly explained, insurmountable barriers may be erected. A negative decision in the early stage will be difficult to overcome.

Whoever conceived and developed the idea of the Malaria-Control Units may well feel that he has done his part toward winning the war, for their work has been of inestimable benefit. Soon after the local Malaria-Control Unit was established, a statement was issued bringing it to the attention of the Army and Navy authorities that all the necessary conditions were present to produce a severe epidemic of dengue, and advising prompt action. Aedes mosquitoes were breeding abundantly all over the area. The rainy season was about to begin. An outbreak of dengue existed on neighboring islands from which patients with the disease were being evacuated to this base. In spite of this warning, no adequate official action was taken.

Dengue appeared as predicted, and there were 80,000 sick days among the Army and Navy personnel in three months. Some commands had as high as twelve percent of their men on the sick list at a time. This was sufficiently impressive so that those in command began to realize that disease could be a greater menace than combat wounds. As the dengue increased, the senior medical officers of the Army and Navy met to consider how the situation should be handled, for it was agreed that concerted action was necessary if serious damage was to be avoided. The stage was all set, with conditions favorable for the spread of several insect-borne diseases.

The necessary protective steps were deemed to be:

a. Identical sanitary orders for both services.

b. Appointment of a sanitary officer with definite authority and responsibility.

c. Strong official backing to enforce sanitary orders.

d. Sanitary control of neutral areas, belonging neither to Army or Navy, by consultation between the two commands.

There was prompt action on these recommendations.

From this point on, there was rapid development of sanitary consciousness throughout the base. Our sanitary officer inspected about sixty camps, accompanied in each case by the local medical officers. He made recommendations in writing to the commanding officer of each unit. A week later the inspection was repeated; and if sufficient progress

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had not been made in correcting the insanitary conditions, the facts were reported to the commanding officer of the base. Prompt and effective action followed. There was always complete cooperation between the medical officers of the Army and the Navy, with frequent consultations on methods, procedures, and recommendations. There were many difficult situations for which harmonious settlements were found.

After this stage was reached, success was cumulative. Medical officers and commanding officers stopped in to ask the sanitary officer to inspect their camps and report unsatisfactory conditions so that they could get them corrected. There was considerable rivalry, with various units competing in the effort to have the cleanest camp. Requests were made for inspection of intended camp sites before the men were moved in. Screening became available, deep-hole privies replaced the open straddle trenches or shallow holes. A garbage lighter was secured to carry the waste material to sea and dump it. Trash dumps, carefully controlled, were provided for burnable and non-burnable waste. An adequate supply of safe water was provided. In the space of six months, the base had reached sanitary maturity.

Since the arrival of the American forces, a large number of the plantation owners have leased their plantations to the United States and have gone away to the south to live on their income. Most of the natives have returned to their villages, but those who remain on the plantations, together with the Tonkinese, are a constant menace to the health of the armed forces. Dengue, malaria, filariasis, amebiasis, and intestinal parasites are common among them, and insect vectors are present to aid in the spread of those diseases.

At first the natives were frequently in the camps, even after dark. They were never protected from mosquitoes, and the majority of them had had malaria since childhood. There was every opportunity for the local mosquitoes to become infected. Later, the policy was adopted of having no camps within two miles of native villages, and efforts were made to keep the natives away from the camps except during the daylight hours.

The presence of these natives is a matter of great sanitary importance to the naval base. Their villages are located among the streams where mosquitoes breed in great profusion, so they form a reservoir of mosquito-borne diseases with all the means of transmitting them to our men. Most of them have intestinal parasites, and many are ameba carriers. They know no reason why they should not defecate near water sources and close to camps. Their clearings in the jungle offer excellent sites for gun emplacements, searchlights, and other military needs; so there is frequently good reason for the desire to establish new camps in the very midst of the native dwellings.

Medical officers are applying what counter-pressure they can, endeavoring to delay occupation of such sites until the area can be surveyed and steps taken to reduce the disease damage to our men. They cite many examples from local sources of the rapid decline of the effective force of military units located in areas where malaria and other insect-borne diseases exist. In some cases, it has been possible to have natives removed to a safe distance and to have considerable mosquito-control work done before our forces moved in. This has greatly increased the comfort of the men and has kept the sick list down to a minimum. Now that the rate of expansion and new construction has slowed down, it is hoped that this preliminary work can be made the routine procedure.

Problems of Construction

When the base was first occupied, roads were built in great haste to provide for military needs and to get the stores off the ships. There was no time to think of culverts, ditches, or drainage problems. The roads made barriers to the natural drainage and produced countless pools which lasted throughout the rainy season. Clearings made in the jungle for fuel and munition dumps provided ruts and depressions to hold water. Bombs piled at a certain angle and fuel drums stacked on

and furnished ideal collections of water for mosquito breeding.

The work went on night and day—blasting, moving, and transporting materials, excavating with power shovels and bulldozers. Always it seemed it was raining—a true tropical downpour. The Malaria-Control Unit traced the spread of Aedes and Anopheles mosquitoes, from their permanent breeding places in the river valleys close to the native villages, to all parts of the base as the artificial pools became populated with larvae.

So rapid was the progress made by the construction battalions that six months later roads were well ditched, culverts were provided at intersections, and rutted lanes between the rows of coconut trees were leveled and drained. Roads had been built into fuel and ammunition dumps; tin can dumps had been cleaned up; bombs and oil drums had been re-stacked so that they held no water; stocks of corrugated iron and plumbing fixtures had been rearranged so that pools of water no longer collected in them. It was difficult to find a mosquito within the occupied area. Even the occurrence of seven inches of rain in a single day did not produce any pools for breeding.

Garbage and Waste Disposal

In the early days, each unit carried its kitchen waste and other wastes a short distance from camp and then dumped them. This produced numerous areas where flies were breeding profusely. The tin cans, pieces of canvas, and other discarded articles held enough water to breed mosquitoes.

At the next stage of development, long deep pits were dug by bulldozers. Into these the garbage was dumped. It was intended that at the end of each day the waste would be sprayed with oil, burned, and then earth pushed over the day's deposit by a bulldozer. As long as this was done, the method was very satisfactory; but intelligent supervision was lacking. It was laborious, and those in charge soon became careless. As a result, garbage was scattered over large areas and fly breeding again became extensive.

Then the order was issued that each unit would burn its own waste. This was during the wet season when the rain averaged about an inch a day, and it was difficult to dry anything enough so it would burn. Fuel was a critical item in that remote base at that time. None of the usual types of field incinerators was found satisfactory with such heavy rains. The problem was finally solved when a garbage lighter was obtained and a pier was built so that trucks could drive out and dump their contents into the lighter. At night the lighter was towed to sea and dumped. A hose was provided on the pier, and the working party with each truck was required to wash the cans and the truck before leaving the pier. Very careful supervision was necessary to maintain good sanitary standards.

After the garbage lighter was established, a careful search was made throughout the base for areas where garbage had been dumped, and any refuse found was buried by bulldozers. A sign was posted prohibiting dumping, and frequent inspections were made. This work was done by the Army's sanitary organization. Identifying those who continued to dump their garbage promiscuously became an interesting detective game. It was usually possible to identify the waste by some means. Then the commanding officer of the offending unit was required to have the area cleaned and to explain in person to the commanding general or the base commander. This was most effective, and this nuisance was soon under control. As rapidly as material became available, screened garbage huts with concrete decks were provided. Constant inspection was necessary to insure that the screen doors were kept closed and that garbage was not scattered where it would serve to breed flies and rats.

Grease traps were constructed for galley wastes and sumps twenty feet deep by fifteen feet square were dug to receive the effluent from the traps. For a time, the liquid drained away through the porous coral very well, but soon the surfaces became covered with grease and absorption ceased. A system of sewerage eventually was decided upon to dispose of this waste.

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Water

Local residents were accustomed to use water from shallow wells, sharing it with their animals; but examination showed the water from them to be far below our standards for potable water. First comers chlorinated the water in their canteens, but this is never a pleasant drink, and they were glad to get away from it as soon as possible. Amebiasis was endemic among the local people and outbreaks of bacillary dysentery were frequent. Large distilling units were soon procured, and the goal was set of a gallon of water per day per man. The distillers burned oil, which was a critical item. There was much careless handling of the distilled water; tanks and containers were frequently contaminated; and hoses were often dropped in the mud. Fortunately, no really serious diseases resulted. The water was distributed by tank trucks. The portable distillers and chlorinating units have greatly simplified the problem of supplying safe water in the field and at advanced bases.

Later, a stream of water was discovered coming out between a thick layer of volcanic rock above, and a coral bed below. The water shed for many miles back was a primitive jungle with no human habitation. A deep well was dug and cased with concrete. A modern water-purification plant was installed and, by this time, enough pipe was available to supply safe water to nearby units.

Food

For supplies of food we were dependent upon the Army. The first provisions came ashore in lighters that were hauled to the beach at high tide and unloaded after the tide had receded. Boxes and cans were stacked in the nearest area that was reasonably protected from aerial observation. Some efforts were made to protect bags of flour and sugar from the incessant rains by tarpaulins, of which there never were enough. As the boxes were piled higher and higher, the lower tiers sank into the spongy soil. It was many months before sheds could be erected to receive the food stores and by that time many of the cans in the lower tiers had rusted through so that there was much loss—one of the tragedies of war.

Field mess gear was used at first by most units, and this has several hygienic virtues as well as some dangers. Each man retains his own utensils. After eating, he passes down a line of gasoline drums. Into the first he dumps the waste food; the next one contains boiling soapy water, in which he washes his utensils; then he passes on to the third, in which he rinses them in clean boiling water. If the fire is well maintained, this provides very satisfactory sterilization of his mess gear. After the meal, the mess gear was usually hung on a tree or in the man's tent where it provided a gathering place for flies. Some units covered this defect by providing drums of boiling water for cleaning the mess gear before being used at the next meal.

Our hospital was fortunate in that its staff had brought large amounts of vegetable seeds. An extensive garden was one of the early projects and there were soon large crops of lettuce, tomatoes, radishes, cucumbers, and onions, which were most welcome additions to the hospital diet.

The base refrigeration depot was inadequate in the early days, and access to the boxes could be had only by wading in deep mud. Inside the boxes the decks were often muddy and there were muddy footprints on the frozen quarters of meat. Cases containing cheeses, hams, and bacon were piled outside. When issues of meat and fruit were to be made from the refrigerator, trucks that had been hauling garbage would stop for the food with the floors and sides of the trucks still soiled with garbage. Under such conditions it was not surprising that dysentery and other gastrointestinal disorders were common. In most cases, it was only necessary for the sanitary officer to call attention to these evidences of careless handling, and they would be quickly corrected; but it required continual vigilance to maintain good sanitary conditions.

Latrines and Urinals

Before leaving the United States, considerable study was given to the subject of la-

trines by the medical unit. Standard types and sizes of latrine boxes varying from two to eight holes each were made in considerable numbers so that they could be knocked down, secured by metal straps, and easily transported. These were shipped out with the sanitary officer, who accompanied the first echelon. These latrine boxes were used at first over shallow trenches, but this was regarded as a temporary expedient and not suited to the needs of a large permanent base. The seat covers were so arranged that they would close automatically when not in use, but the men found ways to prop them open and thus allow light and flies to enter. Screening material was not available for latrines or for mess halls until much later. Shallow trenches were used in some areas and, in spite of ditching and banking around them, were frequently flooded by the heavy rains and their contents washed out over the neighboring ground. Or else the earth would cave in at the sides and expose the trench to light and flies.

Then it was decided to adopt a modification of the deep-hole privy that has been used with great success in the Orient for over twenty years by the Rockefeller Foundation and other sanitary organizations in their campaigns against hook worms and various intestinal diseases. As used there, it consists of a hole about sixteen inches in diameter, and twelve to fifteen feet in depth, for which a special boring machine is used. Over the hole is placed a light-tight latrine box. Their reports state that it loses nothing of its efficiency if the bottom of the hole is below the level of the ground water. Its advantages are that it is too deep for the larvae of intestinal parasites to make their way to the surface. Flies will not go down to such depth in a dark hole to lay their eggs. Gaseous products of fecal decomposition will not rise to the top during their redolent stage, because they are heavier than air.

To provide for our large group of men, we adopted a latrine with a pit eight by ten feet and twenty feet deep. A clam-shell digger was used and after reaching the coral below the topsoil, it was necessary to use blasting powder. One crew could dig such a pit in about two days. Because the topsoil was so spongy, it was necessary to line the holes with wood to prevent the sides falling in. Over the hole was placed the standard latrine box of a size varying with the needs, from two to eight holes.

When the deep-hole latrine is properly used, it is not necessary to burn it out with oil or to use any chemical disinfectant. After some of the pits began to fill and the contents rose near the top, yeast was used to good effect to prevent odors.

As the base developed and became more crowded, it was no longer desirable to have a large number of latrines, many of which were not under good sanitary control. Materials eventually became available for construction of a sewerage system, and the installation of modern flush toilets.

The use of shallow trenches for latrines, either with or without boxes, should be regarded as only a most temporary expedient for use in the field. A stay longer than a few days demands construction of more elaborate facilities.

URINALS

At first, oil drums were used; both ends were removed and they were buried about three-fourths of their depth, then filled with stones. These soon became odorous and attracted flies. Sprinkling with oil and burning daily helped to make them less offensive. A type that we finally found most useful in the open was a two-inch galvanized pipe with a cone made from a tin can fastened to the end. The large end of the cone was covered with wire netting. A hole down in the coral was dug, and the pipe placed in it with the cone at a convenient height. Then the hole was filled around the pipe with rocks and earth. A bucket of soapy water from showers or scrub tables was poured through the funnel once a day, serving to keep it clean and almost odorless.

RATS

It may be accepted as an axiom that wherever there are coconut trees there are rats. They nest safely and comfortably in the crown of the coconut tree and find abundant

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food at their very elbows. In an area where plague and typhus are a constant menace, rodents gain an importance which transcends their role as destroyers and contaminators of food materials.

Rats bred freely in the piles of coconuts which accumulated in many parts of our base. When these piles were taken away, the rats moved into our barracks, mess halls, and commissary storehouses. It is accepted as a fact by public-health workers that it is impossible to reduce the rodent population by trapping or poisoning if there is ample food supply. There will always be the full number of rats that the food supply will support. Therefore, the most effective method of rat control is by reducing the food and water available to them.

Our main effort was to keep rats as far away as possible so that there would be a minimum of contact with the men and the food of our forces. Frequent inspections were made of commissary storerooms, galleys, mess halls, and garbage sheds. When any evidence of rodents was discovered, a careful search was made for their nesting places and their sources of food and water supply. After these were corrected, a campaign of trapping and poisoning was started. All dead rats were sent to the laboratory where they were combed for fleas and then carefully examined for evidences of disease.

Flies

In an area such as ours where both amebic and bacillary dysentery prevail, fly control must assume great importance. Screening material in the early days was very difficult to obtain. Latrines, galleys, and mess halls were unprotected and flies were abundant. This condition was improved as shipping space became available and screening material was given a higher priority on the list of essential items.

During the wet season, the garbage and the manure of horses and cows were too thoroughly soaked by the continual rains to be at their best for fly breeding. As the rains diminished, however, conditions became more favorable, and the number of flies increased. Overripe papayas and bread fruit fell to the ground and decayed there, the pulp providing perfect breeding material. The soil near garbage cans, unless carefully cleaned, would soon be crawling with maggots.

To combat this, frequent inspections and a high degree of cleanliness were required. Fly traps were provided for latrines and mess halls. Galleys were sprayed with insecticide after each meal. Food and dishes were carefully screened between meals. By thorough enforcement of all these regulations, the fly-borne diseases were kept to a minimum.

Mosquito-Borne Diseases

Filariasis did not prove to be a serious problem at our base, though it was prevalent among the native population. What cases we had came to our hospital by evacuation from other bases. At the time I left, controversy was still raging over the criteria for diagnosis of the disease, its treatment, and the danger of planting it in the United States by sending home men who were infected.

The vector of the disease was present, and it was prevalent among the natives. The danger of infection was reduced as far as possible by keeping the natives away from our camps and by constant efforts to reduce mosquito breeding.

Dengue, as has been stated, caused 80,000 sick days at this base in three months. Some units had as many as twelve percent of the men sick at one time, and more than forty percent of some commands had the disease during the three months. Thus it seriously impaired the efficiency of the command during a very critical period. The disease was of a much milder type than we were accustomed to see in the Philippine Islands.

Immediate attention was given to mechanical protection of the men by requiring bed nets or screened sleeping spaces; head nets and gloves were required for sentries after dark. Attendance at movies was not permitted unless men wore shirts and long trousers. Living quarters were sprayed with insecticide twice daily. All camps and their surroundings were inspected, and breeding places received suitable attention. As a result, the incidence

of dengue began to fall, even before the rains diminished. The Malaria-Control Unit aided in the campaign against dengue and their crews of trained mosquito searchers did valuable work.

As the dengue and malaria subsided, there was a very human tendency to relax all precautions. One commanding officer of a unit expressed it thus: "Why continue to buy meat for a dead dog?" The diminishing sick list was used as an argument against further sanitary precautions. To combat this tendency, it was necessary to have administrative pressure applied from the top to assure that the work would be carried on.

Personal Hygiene

In the early days, men and officers alike worked in the rain and mud all day, turned into damp beds at night, and when they arose put on the same wet, muddy clothes again. In the constant rain and high humidity nothing dried and everything soon took on a thick coating of mold. Most men were moved by the determination to climb up out of the mud and to improve their living conditions, but a few appeared to feel that special virtue and credit were attached to such a lowly life and showed little tendency to improve their lot when the necessity for discomfort no longer existed. As dry living quarters, hard roads, showers, and hot water were achieved, one by one, there was an accompanying improvement in the morale of all hands. Excellent living conditions were eventually provided, and washing machines of the household type enabled men to keep their clothes clean. The hospital corpsmen could wear whites and go to and from their work without getting in mud.

The fungus infections were very prevalent and we found they could disable large numbers of men just as effectively as the more serious diseases. Some of our local Rube Goldbergs built a very satisfactory air-conditioned ward for our allergic patients; but we found, to our surprise, that patients with fungus infections when placed in this ward cleared up like magic.

Fatigue developed early in men of the construction battalions; they are an older age group and many had defective teeth, eyes, and feet on entering the service. Most of them kept on trying to hit the ball long after they should have stopped to rest. Optical and prosthetic dental facilities are especially important to these men.

Asthma and other allergies were numerous. It was found that some of the most important men with special qualifications suffered from allergy. In such a hot, humid climate moulds are present in great numbers, and many persons are sensitive to them who have never before suffered from allergy. If men with this trouble can sleep at night, many of them can continue to work during the day, and so they can be saved to the base instead of having to be evacuated. Our air-conditioned ward proved to be a great boon to such men and aided in maintaining the work of the base.

Our experience indicates that the best-disciplined outfits have the smallest sick list, that the non-effective rate can be kept down by careful attention to the details of sanitation. To accomplish this requires unremitting attention by medical and commanding officers.

Anyone who has been on the fighting front knows the indescribable tension that takes possession of the vast majority of the men during the minutes preceding the zero hour—the minute predetermined for the beginning of the attack; and that every postponement may, through repetition, destroy the impetuosity of the attack.

—Lieutenant General Dittmar in *Pester Lloyd*,
Budapest, Hungary.

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Reconnaissance and Deployment

COLONEL E. CLARKE, *General Staff* (British Army)
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THE need for reconnaissance is constantly stressed in all manuals and in reports from theaters of operations. Reconnaissance and planning for probable action are continuous once contact with the enemy has been gained. It is apparent, however, from recent reports that the need for personal reconnaissance is not always realized. If there is not time for personal reconnaissance then the least that can be done is to accept the advice of those already in contact with the enemy or leave to them a certain amount of initiative regarding the action they are ordered to take. The divisional or regimental

Group	*Regt*	*Bn*	*Coy*	*Platoons of Rifle and HQ Coys*	*Remarks*
Recce (R)	Regtl Comd S3 or S2 Sig Offr A Tk Bty Comd or AA Bty Comd Wireless set Dispatch riders Similar "R" Gps of attached units may accompany Bn "R" Gp. (a)	Bn Comd S3 or S2 Sig Offr Dispatch rider Similar "R" Gps of attached subunits may accompany Bn "R" Gp. (b)	Coy Comd Orderly	Platoon Comd Orderly	(a) e.g., Arty Regt or Gp, Tank Bn, Fd Coy, MG Coy, etc. (b) e.g., Arty, A Tk, Lt AA, Tank, & MG subunits, Secs of Fd Coy. (c) In certain circumstances, may be with "T" Gp.
Order (O)	Bn "R" Gps	Coy "R" Gps "R" Gps of HQ Coy Platoons	Platoon "R" Gps	Squad or Detachment Comd	
Fighting (F)	Three Inf Bns Units under Comd	Bn HQ Four Rifle Coys Platoons of HQ Coy "A" trains (c)	Coy HQ Three platoons Platoon trucks (c)	Platoon HQ Squad or Dets Platoon trucks (c)	NOTE: Neither S3 from Regt HQ nor S3 from Bn HQ should be absent at same time as Comds.
Tpt (T)	Regt HQ Adm Tpt (if any) "B" trains of Bns	"B" trains if under Bn control			

The English abbreviations employed above should be clear to American readers with the possible exception of those defined below.—The Editor.

A Tk = antitank
Comd = commander
Coy = company
Fd = field
Recce = reconnaissance
Tpt = transport

FIGURE 1.

commander should determine, from his map reconnaissance, the areas to be reconnoitered, their important terrain features, and the itinerary. He will usually be able to make a tentative plan and decide how, when, and where he will issue his orders. If the situation permits the assembling of subordinates to receive his orders, he directs, before departing, that they are told the hour and place of assembly.

Attack undoubtedly requires personal reconnaissance to a greater extent than any other phase of operations. If personal reconnaissance can be made, time and terrain allowing, then it is wrong to neglect it. If it cannot be made it will be necessary to rely on air photographs. However, there is little doubt that if all leaders down to squad leaders have had an opportunity of viewing the ground over which they are to fight they will have greater chance of success and will be able to make their orders absolutely clear to subordinates.

Let us consider a drill with reference to one particular operation, i.e., an attack over ground which can be seen from good viewpoints, and in which the time factor is such that success is more important than speed. Such a drill can be adapted or curtailed for other situations according to conditions.

The following drill is typical of that adopted by many British divisions, and inclusion of something similar in SOP of divisions may well reduce time spent in reconnaissance and deployment.

Organization of Groups.—Each echelon lays down the composition of its groups which are divided into:

(a) Reconnaissance Group	("R" Group)
(b) Orders Group	("O" Group)
(c) Fighting Group	("F" Group)
(d) Transport Group	("T" Group)

The composition of the various groups would have to be varied in special circumstances but might be composed as follows:

Division "R" Group
CG
G-3 or Assistant
Signal Officer
Artillery Commander
Commander of troops attached for this operation
Engineer Officer
Wireless set
Dispatch riders

Regimental, battalion, and other groups might be composed as shown in Figure 1. These groups also may have to be varied in special circumstances.

As soon as divisional "R" Group moves forward, it orders the "R" Groups of regiments to be at a certain place at a given time to receive orders. Regiments give their "O" Groups orders to move forward at a later hour to receive orders from the regimental commander. "F" Groups (battalions, etc.) similarly receive a warning order to move and automatically send forward parties to reconnoiter the indicated assembly area. The same process is carried on down to platoons with time intervals according to the situation.

Let us see how this arrangement would work in a specific situation. 1 Div is in position having been repulsed in an attack on position "B" but having captured "C" (Figure 2). 2 Div is to come forward from a position six miles in rear and to attack through 1 Div to capture "D" and then "B." Orders to this effect are received at 0845. The following time table shows suggested program for reconnaissance and deployment of the division.

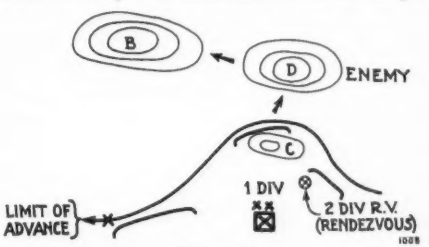
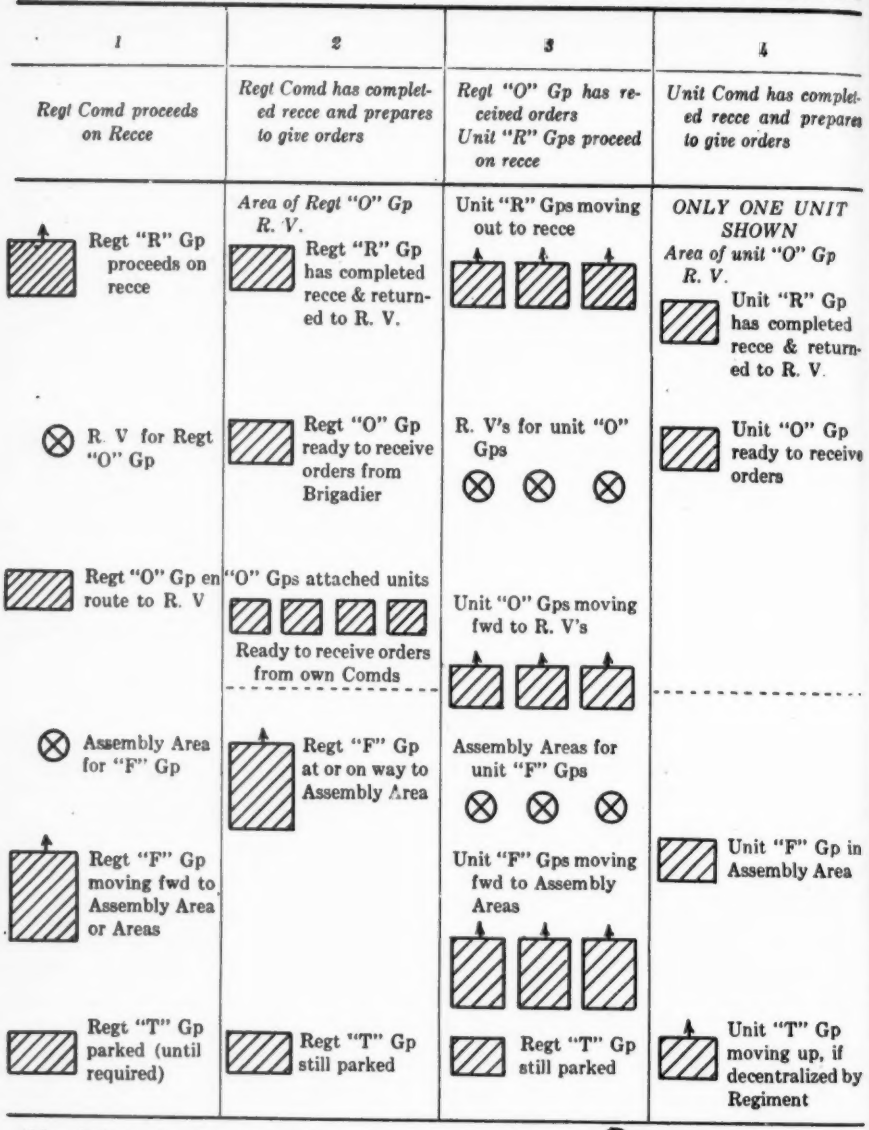


FIGURE 2.

0900- —2 Div Comdr with Div "R" Group moves to Hq 1 Div preparatory to making personal reconnaissance. Regtl "R" Groups are instructed to be at Hq 1 Div by 1030 hrs to

DIAGRAMMATIC ILLUSTRATION OF STAGES OF DEPLOYMENT OF A REGIMENT


1
2
3
4
Regt Comd proceeds on Recce
Regt Comd has completed recce and prepares to give orders
Regt "O" Gp has received orders
Unit "R" Gps proceed on recce
Unit Comd has completed recce and prepares to give orders
Regt "R" Gp proceeds on recce
Area of Regt "O" Gp R. V.
Regt "R" Gp has completed recce & returned to R. V.
Unit "R" Gps moving out to recce
ONLY ONE UNIT SHOWN
Area of unit "O" Gp R. V.
Unit "R" Gp has completed recce & returned to R. V.
R. V for Regt "O" Gp
Regt "O" Gp ready to receive orders from Brigadier
R. V's for unit "O" Gps
Unit "O" Gp ready to receive orders
Regt "O" Gp en route to R. V
"O" Gps attached units
Ready to receive orders from own Comds
Unit "O" Gps moving fwd to R. V's
Assembly Area for "F" Gp
Regt "F" Gp at or on way to Assembly Area
Assembly Areas for unit "F" Gps
Regt "F" Gp moving fwd to Assembly Area or Areas
Unit "F" Gps moving fwd to Assembly Areas
Unit "F" Gp in Assembly Area
Regt "T" Gp parked (until required)
Regt "T" Gp still parked
Regt "T" Gp still parked
Unit "T" Gp moving up, if decentralized by Regiment

Abbreviations: Comd = commander. Recce = reconnaissance. ⊗ R. V = rendezvous.

FIGURE 3.

receive orders. On receipt of these instructions Regtl "O" and "F" Groups are given a warning order and reconnaissance of assembly areas behind 1 Div begins.

1030-1115—Div CG gives orders to the Brigadiers, and at the same time the Regtl and Arty "O" Groups move forward. "F" Groups prepare to move, and reconnoiter assembly positions forward.

1115-1230—Regtl "R" Groups carry out reconnaissance.

1230-1315—Regtl Comdrs issue orders.

1315-1430—Bn Comdrs proceed on reconnaissance.
Bn "O" Groups move forward.

1430-1500—Bn Comdrs give orders.
Bn "F" Groups move forward.

1500-1600—Co Comdrs proceed on reconnaissance.
Co "O" Groups move forward.

1600-1630—Co Comdrs give orders.
Co "F" Groups move forward.

1630-1730—Platoon Comdrs proceed on reconnaissance.
Squads move forward.

1730-1800—Platoon Comdrs give orders and squad leaders proceed on reconnaissance.

It will be seen that there is a thorough reconnaissance by the "R" Groups of each echelon while their "O" Groups move forward to receive orders. During this time the "F" Groups or fighting troops reconnoiter their new assembly areas and prepare to move forward.

Although this drill appears complicated it is really simple if considered first from the divisional, then from the regimental point of view, and so on down the scale.

Figure 3 shows the stages in deployment of a regiment, the divisional commander having gone ahead to reconnoiter and having ordered the Div "O" Groups forward.

If commanders and staffs sit back and visualize the operations by a series of goose eggs on the operations map at CP, then operations will prove costly in men's lives. Some drill such as given briefly above should be adopted by all headquarters.

The Colonel

OF THE names given to officer ranks in the United States Army, *Colonel* is the most unusual because of the distinct variance between its spelling and its pronunciation.

In "A New English Dictionary" one finds that *colonel* stems originally from the Latin *columna,* column, and arises more directly from the Italian *colonello, colonella,* a little column or pillar. Carried over to French, the word appears in a military sense in *la compagnie colonelle* or simply *la colonelle,* which designates the first company of a regiment of infantry.

Walter William Skeat, the English philologist, says, "The colonel was so called because leading the little column or company at the head of the regiment."

In France the early form was *coronel,* still used in Spanish. This spelling was due to the dissimilation of the *l*'s, common in Romanic, though popular etymology associated *coronel* with *corona, couronne,* crown. Late in the 16th Century this early French form was supplanted in literary use by the more etymological *colonnel,* and under this influence and that of translations of Italian military treatises *colonel* also appeared in English around 1580. *Coronel* was the form which prevailed in England until 1630, but it disappeared in writing about 1650.

In the 17th Century *colonell* was trisyllabic and was often accented on the last syllable in verse. By 1669, however, it began to be reduced in pronunciation to two syllables. Dr. A. J. Ellis in "English Pronunciation" credits Richard Brinsley Sheridan, the English dramatist, with establishing the present pronunciation in 1780.

Military Railway Service in World War II

LIEUTENANT COLONEL JEFFERSON H. MYERS, *Transportation Corps*
Instructor, Command and General Staff School

THE Iron Horse is not dead! Again in time of war in theaters of operations round the world the railroad has proved its ability to haul large volumes of men and supplies quickly and economically. It can truthfully be said, "The sun never sets on American railroad troops; they are scattered round the world."

On paper at least, the United States Army has had a Military Railway Service since World War I. It was part of the Corps of Engineers until 1942. War Department General Order No. 60, 16 Nov 42, transferred it to the newly formed Transportation Corps. Let us review briefly the organization of the Military Railway Service as described in FM 55-50. Our Military Railway Service is organized as nearly like American commercial railroads as military necessity will permit; hence we find many railroad titles carried over into the organization of the Military Railway Service. We find a good example of this right at the top—the Commanding General of the Military Railway Service is better known as General Manager, Military Railway Service. He has a Headquarters and Headquarters Company, Military Railway Service which is the highest headquarters of the Military Railway Service in any theater of operations having a complete military railroad organization. Below this headquarters we find one or more Headquarters and Headquarters Company, Railway Grand Division, and here again we find the use of commercial titles, the Colonel in charge being called General Superintendent, Railway Grand Division. In a Railway Grand Division we find two or more Railway Divisions, each operated by a Railway Operating Battalion and one or more Railway Shop Battalions. The Lieutenant Colonel commanding the Railway Operating Battalion holds the title, Superintendent, Railway Division. The Lieutenant Colonel commanding the Railway Shop Battalion is also known as General Shop Superintendent. Each Railway Operating Battalion is normally assigned from ninety to 150 miles of main line track. Its four companies, (Headquarters and Headquarters Company, Transportation Company, Maintenance of Way Company, and Maintenance of Equipment Company) are capable of operating forty trains per day (twenty in each direction), maintaining up to 150 miles of track and making running repairs to locomotives and cars. The Shop Battalion provides four companies, the men and the heavy equipment necessary to make major repairs to locomotives and cars. This is the organization of the Military Railway Service. Railroad experience cannot be gained in a day or even six months. How, then, were experienced railroad men obtained and trained for the Military Railway Service?

A rather unique method of obtaining experienced railroad personnel was put into effect. All of the large railway systems in this country were asked to sponsor one or more operating and shop battalions. Two or more small railroads were urged to sponsor jointly an operating or shop battalion. The sponsor or sponsors furnished experienced personnel both for officers and enlisted men. Men from regular selective service channels made up the bulk of the privates especially in those battalions activated in 1943 and 1944.

Upon activation, a unit is given training along the usual military lines; however, its technical training is accomplished in one of two ways: The Chief of Transportation arranges by contract actually to place the unit with one of our commercial railroads where the army personnel can actually perform various railroad duties under the guidance of railroad operating personnel; or a unit may be sent to operate the army-owned Claiborne and Polk Railroad, known to military railway operating battalions round the world as "Old Crime and Punishment," and said "to have been laid out in the dark of the moon by a cross-eyed man with the d.t's." The road was built by the 711th Op-

erating Battalion with the assistance of army engineers as a training line for railroad troops; all the handicaps and hazards that nature and man could devise seemed to be concentrated on this single-track railroad. It is said that "railway operating battalions left the C. and P. with a sigh of relief, knowing that any operating problems they would

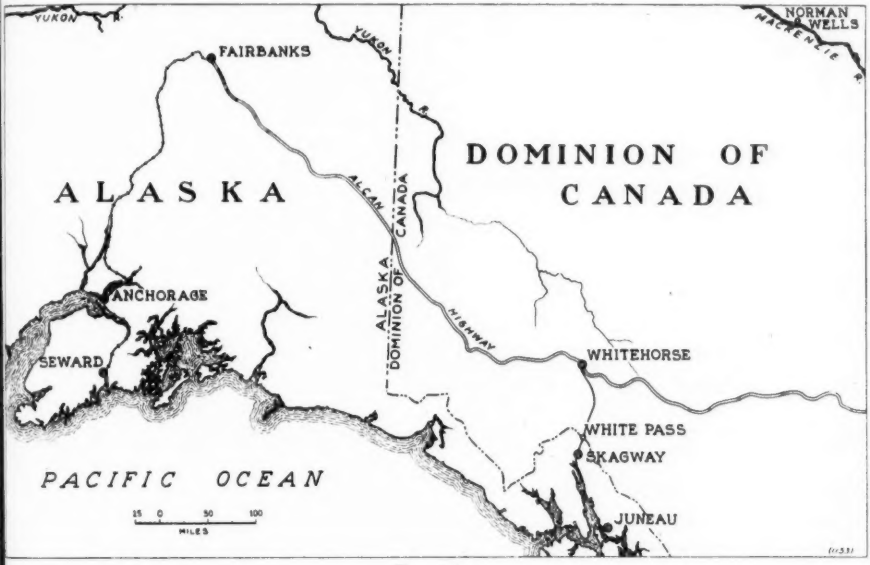


FIGURE 1.

encounter overseas would be 'duck soup' after the C. and P." So much for the organization and training of railway units. What have they actually done in this war?

Perhaps the easiest way to handle this question is to describe the work of the military railroad units chronologically.

The first military railway unit to operate a railroad was the railway operating battalion which took over the operation and maintenance of the White Pass and Yukon Railway between the port at Skagway, Alaska, and Whitehorse, near the headwaters of the Yukon River (see Figure 1). In the fall of 1942, Whitehorse suddenly became a focal point of interest; the Alcan Highway was being constructed from near Edmonton, Alberta, to Fairbanks, Alaska. Personnel, material, and supplies for this road could be moved both north and south from Whitehorse. The town was also to be the western terminus of a 450 mile pipeline from the oil wells at Norman, up near the Arctic Circle.

The White Pass and Yukon, constructed in 1901 to serve those who sought their fortune in the Klondike gold rush, had been operated by a London syndicate. On 1 October 1942 the line was taken over by the War Department, under a continuing lease. By terms of the lease the Transportation Corps will operate the line for the duration of the war and one year thereafter.

Never equipped to operate as a heavy freight line and always harassed by severe winter operating conditions, it was physically impossible for the private company to handle the suddenly imposed war load. After the execution of the lease, an operating battalion was given the task of rehabilitating the facilities and providing adequate operating personnel. This battalion has moved the largest tonnage in the road's history with

surprising regularity over the famous White Pass.

The government-owned Alaska Railroad between Seward and Fairbanks found itself confronted by heavy war traffic and a criti-

FIGURE 2.

cal manpower shortage. The management of the railroad submitted a request to the War Department for assistance. A railway battalion was immediately sent to supplement the railroad's civilian personnel.

From Alaska to New Caledonia in the Southwest Pacific is a jump nearly a third around the world, but here we next find Americans operating a railroad. This time we find a railway operating company largely recruited from American troops in the area, operating the thirty-two-mile narrow-gauge railroad on the island.

In the Southwest Pacific we find the Australian Railways adequately operated by their own managements, but we also find American railway experts from Transportation Corps studying the rail problems, the greatest of which is the differences in railway gauges throughout Australia.

The Middle East was the next theater to see American railway troops in operation. From the two principal ports on the Persian Gulf, Bandar Shahpur and Khurramshahr, standard gauge railway lines run northward to join at Ahwaz and from there on to the capital at Teheran, some 400 miles from the Gulf (see Figure 2). At Teheran one line of railroad extends in a northeasterly direction to the Caspian seaport of Bandar Shah. A second line constructed to the northwest was intended eventually to connect with the Russian railways at Tabriz. The Trans-Iranian Railway was constructed by British and American engineers for the Iranian government. The work was begun in 1928 and was practically completed in 1939. After the *coup d'état* in 1941, the British took over the operation of the lines from Teheran south; while the Russian sphere of influence controlled all operations north of the capital. "The Russian National Railroads" extending south through the Caucasus and Armenia terminate at Tabriz. These are five-foot gauge. The unfinished gap between the Persian Railroad and the Russian lines is approximately eighty miles, over which all supplies are transported by truck. At the close of 1942, arrangements were made whereby the operation of the lines between the gulf and the capital were turned over to the American Persian Gulf Command, under the immediate direction of the Military Railway Service. By the middle of January 1943 the operations of this railroad were in the hands of American military railway units under supervision of a grand division headquarters. Three operating battalions and a Diesel shop battalion were assigned to the railroad. In addition to the power on hand when the Americans took over, a considerable number of oil-burning locomotives of the 2-8-2 type and also 1,000-horsepower Diesel locomotives of the 0-6-6-0 type were brought over from the United States.

The operations in Iran will make an interesting chapter in the history of American railroading. Stories of mixed train crews with absolutely no understanding of each other's language, have been told frequently. If it were not for the fact that all are rail

road men who understand each other's needs and signs, it would be difficult for an American doughboy conductor to impart his orders to a bearded Persian engineer.

While the line of the railroad itself was one of splendid construction, the methods of communication were inadequate. These have been remedied by installations of our Signal Corps and with operation and maintenance by our railway operating battalions.

On and after 8 November 1942, the Allied North African invasion force landed at the ports of Casablanca, Oran, and Algiers (see figure 3). Later other smaller ports were used to land additional supplies. These ports were connected by a single-track railroad and paved highway which extended parallel to the coast from Casablanca to Tunis, a distance of about 1,400 miles. The highway and railroad are about forty to fifty miles south of, and are parallel to, the Mediterranean coast. Since Oran and Algiers were on the coast, they were connected to the main line by short double-track wye connections. The first American railway troops ashore were part of a railway grand division headquarters and a railway transportation company from England. These were followed in December by a railway operating battalion and part of a railway shop battalion, and in February 1943 by the balance of the railway grand division headquarters, three more companies of the railway shop battalion, and a railway operating battalion. The General Manager, Military Railway Service, also arrived in February with the advanced detachment of Headquarters Military Railway Service.

The French railways, even with the addition of the above mentioned units and new United States locomotives and cars, were insufficient to support the contemplated military operations. The remainder of Headquarters Military Railway Service, two more railway grand division headquarters, and three more operating battalions arrived in May. The addition of these Military Railway Service units brought the total of United States railway troops in North Africa to 5,700. The British Military Railway forces brought in 1,250 men who were distributed on the line supporting the British First Army in Tunisia from the ports of Bone and Tabarka. The United States Military Railway Forces were distributed as follows: a railway grand division to supervise and assist the Moroccan railway operating to Oujda; a railway transportation company to operate between Oujda and Oran and a "C" or maintenance-of-equipment company to assemble United States freight cars on the docks at Oran; another railway grand division headquarters with two operating battalions to operate from Oran through Algiers and Constantine to Philippeville; a shop battalion at Constantine to operate the locomotive shops which repaired French locomotives and assembled narrow-gauge United States locomotives for use between Ouled Rahmoun and Tebessa and on the narrow-gauge lines in Tunisia, where a railway operating battalion served the United States troops of

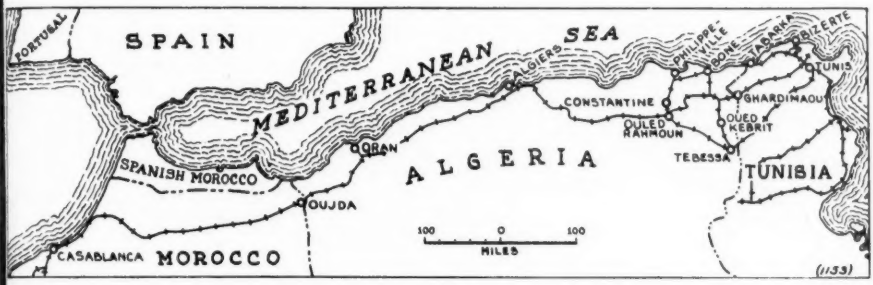


FIGURE 3.

the II Corps on the narrow-gauge line; a railway operating battalion had charge of the line from Constantine to Bone and Ghardimaou, connecting with the British 1st Railway Operating Group at the latter point; another railway operating battalion operated

FIGURE 4.

from Ouled Rahmoun and Constantine to Tebessa and Oued Kebrit, later moving to the narrow-gauge lines in Tunisia when the battalion serving the II Corps on those lines was pulled out for the Sicilian campaign in June 1943.

The first task of the newly appointed Director General of Railways in February 1943 was to gather military railway forces under one control. General Order No. 19, AFHQ, dated 14 February 1943, placed the military railway forces, both British and American, under the Director General, who was assigned to Allied Force Headquarters. He was also given the responsibility for technical development and operation of all railways in North Africa for military purposes. As the French railways are under military government in time of war, use of the railways by the Allied Forces was a matter of negotiation with French military and civilian forces. A further matter of conflicting authority started from the fact that the railway units in the theater had been attached for administration and supply to the three base sections in North Africa. Railway operating forces at work from twenty-four to forty-eight hours running trains were being given daily drill and classroom instruction periods. This was impractical. This conflict of authority was finally stopped in October 1943 by placing the administration of all railway forces under AFHQ through the Director General.

The operating battalion which had been pulled out of North Africa for the Sicilian campaign, as mentioned above, debarked at Licata in Sicily (see Figure 4) on 12 July 1943, three days behind the invasion forces. It soon re-established rail service in spite of blown-up bridges and tunnels. When Palermo was seized by the American forces on 28 July 1943, the military railway service was prepared to supply rail service east to the army then fighting at Cefalu and Castelbuono along the coast of Sicily.

In Italy, a railway grand division headquarters landed an advance party with the first invasion troops at Salerno (see Figure 5). When a railway operating battalion arrived from Sicily, it pushed forward with the grand division headquarters in reinforced strength to Naples where it was soon combined with another railway operating battalion. In contrast to North Africa, the Germans did a thorough job of devastating the Italian railroads—that is, what was left of them after our bombers were through. However, with the aid of all the maintenance-of-way companies from Africa and several army engineer units, and by the assembling of Italian Railway Construction Battalions and civilian contract gangs, the lines were restored from Naples on 1 January 1944, north to Vairano, east to Foggia, and southeast to Bari and Taranto. The line up the east coast along the Adriatic Sea, behind the Eighth Army, was opened from Taranto to Vasto under the direction of the British Railway Forces.

From Italy we move to the British Isles to observe the work of American military railway units stationed there. Since British railroads were adequately manned and managed, it was not necessary to furnish American personnel for railroad operation. However, some switching service was performed at U. S. Army depots by American locomotives and crews.

A considerable number of American Mili-

tary Railway troops were employed at assembling freight cars shipped "knocked down" from the States. By shipping freight cars in pieces, considerable cargo space was saved. These cars and locomotives were assembled for use in France after our invasion of the continent. Special means of handling this heavy equipment were devised and perfected during the months preceding the invasion.

Soldier-railroaders landed in Normandy with the invasion forces. The advance section of the railway battalions came ashore first and, after establishing headquarters, immediately began reconnaissance activities. This reconnaissance group included the General Manager, Military Railway Service, in this theater.

The reconnaissance party moved about in jeeps, including a special rail reconnaissance jeep, the tires of which had been removed, enabling it to run on its rims on the rails.

FIGURE 5.

Damage to the French railway system, caused by bombings by the Allied Air Forces and by the destructiveness of German rear guard actions, was found to be quite extensive. Regions that had not been ruined by demolitions and bombings were heavily mined.

However, the party found large quantities of serviceable equipment. French civilian railroad men returned to the yards and roundhouses soon after the Americans oc-

cupied Cherbourg. They told of various German plans to destroy locomotives and cars. One such plan was to run locomotives, with full steam up, along special tracks sloping into the cold Channel waters. The impact of the cold water would cause the boilers to explode. Allied airmen destroyed the track, thus foiling the German plan.

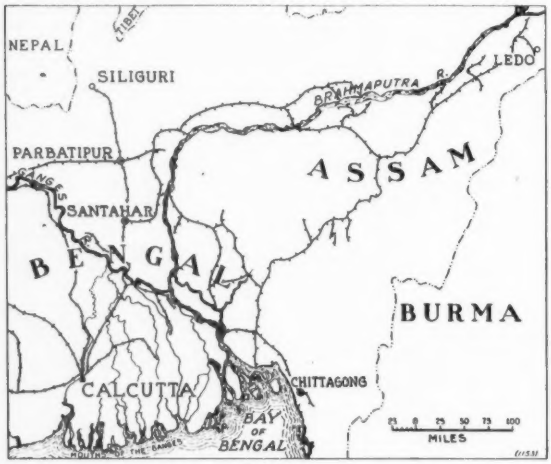


FIGURE 6.

Small American Diesel locomotives and 20-ton flatcars were loaded on special trailers so that they could be pulled through the surf and over the beaches. These were used in repairing the rail lines. By 17 July 1944, the rail net had been restored sufficiently to issue the first U. S. railway timetable in France. This listed scheduled trains, stations, and the mileage between stations. So we again find American Military Railroad personnel serving our armies wherever they may be.

Recent reports from France indicate that American Railway troops are using French civilian railroad personnel to the fullest extent possible for restoring both track and service. At the time of writing this article the exact condition of the French railroad system is still military information of a classified nature. However, the rapidity with which the Germans were driven from French soil would lead one to believe that considerable track and some rolling stock may have escaped the ravages of war.

Our entrance into Germany will present quite a different problem of railroad operation. There will be no friendly, liberated railroad personnel to operate the trains and maintain the track. Then, again, the call will be made on the military railway service to provide the necessary operating and shop battalions.

Even in far-off India we find American Railway Operating Battalions. The Bengal and Assam Railway operation began on 1 March 1944. The Bengal and Assam is divided into two distinct operations. A five-foot six-inch gauge line extends from Calcutta to Siliguri (see Figure 6). Branching off from the broad-gauge lines at Santahar and Parbatipur are meter-gauge lines which run eastward to Ledo. This change of gauge, of course, means all freight for Ledo and China must be transshipped from broad-gauge cars to meter-gauge cars. The ferrying of cars on small barges across the Brahmaputra River, the varying level of which, from dry to monsoon season, prevents bridge construction, presented a problem to our railway troops. Operations have been speeded up by quick switching service from the yards to the barges.

American operating methods in the first two months increased the volume of traffic handled about forty percent. This railroad is now the principal supply line for the Chinese and American forces operating in Northern Burma under General Stilwell.

Although no American railway troops have served with the Russian Armies on the eastern front, it is only fair to mention that numerous American locomotives and freight cars are now being used on the broad-gauge tracks of the Soviet Union, moving the tre-

mendous supplies needed to support the great Russian offensive. These were furnished through lend-lease. Hardly a ship sails for Russia without her deck-load of American-made locomotives and cars.

Lend-lease also is preparing to replace China's worn railway equipment, and who knows but that American Military Railway troops may soon be keeping the railroad trains rolling from Chungking to all parts of China.

Thus it can truly be said, "The deep-throated whistle of the American locomotives can be heard round the world."

Fire!

Released by the Director, Maintenance Division, Army Service Forces.

To overcome the wide-spread ignorance of fire extinguisher operation, the Army is now posting an instructional placard beside each extinguisher in every post, camp, and station. It must be considered the duty of every man and woman in the armed forces and every civilian in the service of the Army to *study* these placards.

In the first place, they give complete operating instructions, with graphic illustrations. And it is essential that everyone know how to operate an extinguisher *before* the occasion to use it arises, for there is no time to learn when fire breaks out.

Second, it is important that everyone become familiar with the different types of extinguishers and know what kinds of fires they are for. An extinguisher that will put out fires of ordinary combustibles may be useless in extinguishing burning oil. Some types of extinguishers which will do a good job on burning oil cannot be used on live electrical equipment. There is a proper type of extinguisher for each type of fire—it is essential that everyone know which extinguisher to use for each type.

In this connection, it must be remembered that the appearance of the extinguisher does not always indicate what type it is, for different ingredients may be used in the same type of container. Therefore, in addition to learning the mechanical operation of different types of containers, the action of various types of ingredients must be known. For instance, the soda-acid and the foam type extinguishers may *look* just alike, but the first is effective only in putting out fires of wood, paper, rubbish, and other ordinary combustibles, while the foam type extinguisher may be used for burning liquids, oils, greases, gasoline, and paint, in addition to ordinary combustibles. In the first case, the liquid stream must be directed against the base of the flame—in the latter, it must be directed against a surface away from the flame in such a way that the foam falls lightly on the surface of the blaze from above. Then, too, one type of extinguisher may be furnished in two sizes, and to avoid waste and undue damage from water and acid the proper size should be used, depending on the size of the fire.

It is, of course, important that fire extinguishers be kept in working order at all times. Therefore, they should be examined frequently. Here, the placards are helpful in giving information as to what to look for in making an examination. They also give the name and phone number of the person to be called when damage is noted.

Fire invariably strikes without regard for our convenience. Quick, sure action, possible only when the operator is thoroughly familiar with the extinguisher he is using, will save thousands of dollars worth of equipment—may often save lives. Every time you pass one of the fire extinguishers that are put up around your barracks, motor pool, workshop, or office, stop and read the placard beside it. *Be prepared.* Learn all you can about the various types of fire extinguishers. Learn how to use them *now*—"just in case."

XUM

Recognition Training in the Army Air Forces

MAJOR CLAUDE M. TERRELL, *Air Corps*
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PRINCIPLES OF INSTRUCTION

IN the Army Air Forces, recognition training has been predicated on the theory that in visual education, as in all forms of education, there are certain basic factors of sound instruction which must be applied if the objective is to be attained. As prescribed by present AAF directives and training manuals, these basic factors may be outlined as follows:

a. In training the student to know and recognize shapes, there is no one "method," "system," or "device" which should be used to the exclusion of other good material or other sound educational and training practices.

b. The interest of the student must be aroused and maintained. Recognition can become a fascinating hobby, but only if the student finds the subject properly "tied in" to his normal duties in combat. This means that in teaching the subject, facts, statistics, performance data, and interest stories become a vital part of training. The *Recognition Journal*, issued monthly by the War and Navy Departments, assists immeasurably in performing this function, while *Recognition Instructors Information Letters*, and the AFTAD *Bulletin*, issued periodically by Training Aids Division, bring the latest available material directly to instructors.

c. The instructor must be well trained. In addition to being familiar with teaching techniques and procedures, he should be able, for example, to "talk shop" with pilot or air-crew personnel and must be an authority on his subject if he is to command the attention and respect of his students.

d. Shapes are learned in four steps, which set the basic pattern for classroom procedures. These are: the *presentation* of the shape, *study*, *review*, and *testing*.

e. A proper syllabus must be prepared for each course in order to lay out in a carefully planned form the material to be presented and studied. It is better to teach a few objects well than a great many only partially.

f. The ultimate objective of recognition training is the recognition of aircraft, ships, or armored vehicles at the maximum possible distance. To achieve this, however, the student must first learn shapes at close ranges. To accomplish this, recognition is generally treated in three stages: elementary, intermediate, and advanced.

IMPLEMENTATION OF PROGRAM OF INSTRUCTION

The AAF program is implemented in three ways: Training directives, training materials, and training devices. We shall discuss them in that order.

a. Training Directives.—On 13 November 1943, the Assistant Chief of Air Staff, Training, issued a directive to the continental commands and air forces that accomplished four objectives: *First*, it established a Class A training list of the forty most important operational aircraft and a Class B list of operational aircraft of secondary importance to be studied if time is available; *Second*, it directed the appointment of a recognition supervisor for each command and continental air force; *Third*, it directed the Training Command to conduct recognition training in such a manner as to enable its graduates to attain satisfactory standards of proficiency; *Fourth*, it directed the phasing of the recognition training program so as to provide coordination of the different stages of training.

Subsequently, further directives were issued providing for (a) aircraft training lists for flexible gunners and ground personnel, (b) teaching naval and merchant ships by types, and (c) training list of most important armored vehicles. The aircraft training lists will shortly be further revised in accordance with the current situation.

Pursuant to these directives from Headquarters, AAF, and directives from the individual Commands and Air Forces, recogni-

tion training has been phased and coordinated along the following general lines:

1. Pilots.

	Hours on Aircraft	*Hours on Ships*	*Hours on Armored Vehicles*
Preflight	29	12	1
Primary	6	3	
Basic	5½	3	½
Advanced	6	3	
Transition	Recognition training in Transitional Schools is only given if the cadet fails to pass a Pre-Test. In such a case, 4 hours is given in single-engine schools, and 6 hours in twin-engine schools. Time is divided approximately 60% to aircraft and 40% to ships.		

2. Bombardiers and Navigators.—Same as for pilots in preflight, with an additional 13 hours in bombardier schools, and 10 hours in navigator schools, divided approximately 70% to aircraft and 30% to ships.

3. Flexible Gunners.—In flexible gunnery schools at present, approximately 10 hours are devoted to aircraft recognition. For students who come from Technical Schools, this represents an addition to recognition training already received there.

4. Air Crew personnel in continental training air forces.—Although the amount of training varies a great deal as between the different Air Forces and as between fighter pilots and bomber air crews, a substantial amount of time is devoted to advanced recognition training, predominantly on aircraft.

5. Ground Personnel.—One hour of recognition training is given at basic training centers. Twenty-four (24) hours training is given in technical courses, with an additional 10 hours in advanced technical courses. Twelve (12) hours of training is given in Overseas Replacement Depots. Substantially all of this training is devoted to aircraft.

These directives are supplemented by the AAF Manual *Instructor's Guide for Recognition Training in the AAF*, which describes the official methods, the available aids, and ways of using them. War Department *Recognition Training* Manual (FM 21-80) has also now become available and should prove helpful, particularly as it treats the problem more from a ground point of view.

b. Training Materials.—These include principally silhouettes, photographs, models, and training films.

Silhouettes—These are the three-view basic "blueprint" or engineering drawings especially adapted for recognition purposes. They are the basis for all recognition instruction and must be used in any recognition course. Silhouettes appear in posters, slides, recognition manuals, and in the *Recognition Journal.*

Photographs—Photographs are used in training to integrate the three silhouettes and to make the students familiar with the object from all different views. Generally speaking, photographs are available in slides, balopticon flash cards, recognition manuals, and in the *Recognition Journal.*

Models—Scale models are of great value, not only because they show the relative sizes of different types, but also because they allow the student to see any view of a given object without being subject to the limitations of photographs which cannot possibly cover every angle of view.

Films—Recognition training films, averaging six to ten minutes in length, are extremely useful as they assist immeasurably in the transition from the classroom to the field. Films approximate actual flying conditions more closely than any other training media. Pursuant to coordinated program of the Army, Navy, and British, there are rapidly becoming available recognition films on operational aircraft of the following types:

Presentation Type—For use in elementary training.

Quizcraft Type—For use in intermediate training.

Testcraft Type—For use in advanced training.

XUM

It is considered that there is not yet a pressing need for recognition films on ships and armored vehicles. However, a few of such films are available and a coordinated program is being studied.

c. Training Devices.—These include the Flash Shutter and Slide Projector, the Opaque Projector, and the Shadowgraph.

Flash Shutter and Slide Projector—Utilizing short exposures of slides on the screen, the Flash Shutter is an extremely useful device for heightening competition and interest in the classroom and for testing. However, claims originally made for this device that it widened the angle of vision and that it solved *all* problems of recognition training are not now considered valid. Digit and counter slides are no longer being used. Exposures faster than 1/10th of a second do not actually represent an increase in difficulty and are not now regularly used in teaching, while extreme distance views often require a 3-second or longer exposure. Nevertheless, this valuable equipment is in use throughout the AAF and serves as the basic recognition training kit. Approximately 3,500 slides are available.

Opaque Projector—The ordinary slide projector is limited to use of available slides. The Opaque Projector (sometimes called Balopticon, Episcope, and Epidiascope), on the other hand, can utilize almost any photograph or printed material from current aviation magazines and journals. Although the Opaque Projector does not give as bright an image as the slide projector, this disadvantage is compensated for by its flexibility. Both types of projector have their place in a well-rounded recognition course.

Shadowgraph—This "device" can be improvised with a sheet and a light source arranged in front of the classroom so that the shadow of a model can be "projected" onto the sheet. In this way, every possible angle of the model can be shown. It is particularly helpful with aircraft as motion can be thus introduced into the instruction. It is the most useful means available for both teaching and testing in recognition when using models.

Testing

One of the most difficult problems in the training program is the development of a valid and practicable method of standard tests to determine whether the student has attained the required degree of proficiency in recognition of *actual aircraft in flight*. Due to unavailability of actual aircraft, testing, like training, must be "synthetic." Slides, at varying shutter speeds, depending upon the difficulty of the view are now generally being used for testing. Slide tests, however, have many disadvantages, including that of requiring a large number of slides not used previously for instruction. A set of test slides of varying difficulty for different phases of training is now under development by Training Aids Division. A number of printed test sheets containing small photographs and sillographs have been prepared and distributed by Training Aids Division and have been successfully used.

A moving picture film (TF 1-3368—"Aircraft Recognition Proficiency Examination, Forms A and B") has been produced with the collaboration of Psychological Test Film Unit at Santa Ana. The use of this film as a testing medium will shortly be evaluated in a coordinated testing program in the Training Command. The film test, however, is subject to many administrative disadvantages due to the time and effort involved in keeping such a test film up to date with current training lists. It is hoped that some form of standard testing procedure will result from this development work.

Research and Experimental Work at Santa Ana

The Psychological Test Film Unit at Santa Ana has recently accomplished considerable experimental work on recognition training. Reports of this work on the most important matters so far completed indicate, among other things, substantially the following:

a. There is very little difference in results as between teaching by "total form"

and by "distinguishing features." When proficiency is measured by slide examination, there may be a slight disadvantage in teaching by "total form."

b. Use of flash shutter speeds over 1/10th of a second are of no particular value in producing greater recognition efficiency.

c. Use in teaching of technique of immediate confirmation and correction of responses leads to better results than otherwise.

d. Use of digit and counter slides does not increase recognition efficiency.

e. There is little difference in result as between presenting similar and dissimilar aircraft together in sequence.

f. Simulated range in slides depends on size of image in the field on the screen but depends only to a slight degree on distance of observer from the screen.

g. Slides are a poor test of recognition proficiency.

h. Printed photographic test sheets have satisfactory reliability as a testing medium.

i. Motion picture tests are recommended as the best testing medium.

SUMMARY

To summarize: In the AAF the visual objectives of recognition training are achieved by a coordinated and directed program which provides the instructor with every reasonably available recognition aid and material to enable him to make his subject interesting enough for his students to want to learn it. In general, it has been our experience that the purely visual aspects of this very visual subject must be supplemented with interesting facts and data to make the training effective. Furthermore, although the recognition training program has been a unique experiment in the teaching and learning of form and shape through vision, it is interesting to note that it has always been necessary fundamentally to base it on accepted principles of general education.

In developing the program, there has been a considerable amount of coordination between Army Air, Ground, and Service Forces; Navy; R.A.F.; R.C.A.F.; and British Army. Training lists, time available, and individual instruction may vary; but it is believed that fundamentally all services utilize substantially the same training methods and aids. The Recognition Sub-Committee of the Joint Clearing Committee on Army and Navy Training Aids, on which the various services are represented, affords a medium for constant interchange of information on the subject. As a result, many of the recognition materials are prepared jointly by the services and used by all of them respectively, such as the *Recognition Journal*, *Pictorial Manuals* (FM 30-30, FM 30-40, FM 30-50), models, slides, posters, and training films. Further experimentation and development work which is always in process will no doubt result from time to time in further improvement of instruction and training materials. No attempt has been made herein to enumerate or describe individual items of available training materials on aircraft, ships, and armored vehicles. This information appears in lists circularized from time to time by Training Aids Division.

The Cub plane has demonstrated its greatest efficiency perhaps on the Normandy battlefront. Except during very bad weather, excellent observation was maintained over the entire American front with the Cub plane. Observers speedily brought fire to bear on targets of opportunity and conducted counterbattery as well as other fires.

—From an observer's report.

The General Staff and the Artillery Survey

CAPTAIN WILLIAM TEIR, *Field Artillery*
Instructor, Command and General Staff School

THE most outstanding progress made in the employment of artillery in this war has been the development of the technique of massing artillery fires. These massed artillery fires have given us battle superiority in many instances in Africa and Italy and are now doing it in France. Even the Japanese report that the American soldier depends on fire power and not his actual ability as a hand-to-hand jungle fighter.

The factors that make the above statements possible are several in number. The one factor that includes the others is flexibility of fires which might be defined as the ability of the bulk of the artillery in the division or the corps to mass its fire rapidly on any target in the sector without changing position.

This flexibility likewise depends on centralized control of all the artillery. Just what do we mean here by centralized control? It is simply the ability to control the fire of all the artillery, from one central headquarters called a Fire Direction Center, by sending fire missions and firing data to the subordinate units. This centralized control is dependent upon the two basic factors of sufficient communications and a coordinated survey.

It is the purpose of this article to bring out the basic essentials of an artillery survey and survey planning, the time necessary for survey, and the fact that artillery survey should be considered in the overall planning of an operation. Although there is a special staff officer on every division, corps, and army staff who is the artillery adviser for the commander, every staff officer should know something about the basic facts of artillery survey. Each staff officer must know more than his own field, he must be familiar with the jobs of the other staff sections with which he works; if he is going to coordinate with the artillery officer in performing his duties he must have some appreciation of the problems the artillery officer is facing. Many times the different members of a staff will want to know just how much and what type artillery support can be expected in an operation and the time it will take to get this support. In many instances the time necessary to get massed artillery fire support will depend primarily upon the time necessary to complete sufficient survey operations for massed artillery fire. In other words, survey time might be the controlling factor.

Taking it for granted, then, that there are sufficient communications for control, it might be stated that a common survey control is the essence of the massed fire capabilities of any unit and is essential to massed artillery fires of that unit. Now just what is *common survey control?* The simplest common survey control is for all echelons or all units to have exactly the same map for computing firing data; however, if they do not have an accurate map then one must be built. Survey is actually building a map and obtaining common survey control by all units and echelons coordinating their work and constructing maps that are similar to each other. To coordinate the fires of all artillery in a corps, the control must necessarily start with the corps echelon and be carried down to the subordinate units: that is, from corps to the divisions and separate battalions, and within the division down to its battalions. Why from the higher to the lower echelon? For the same reason that any other military operation starts at the top and goes down. The artillery supports the operation and the artillery plan is a part of each operations plan. The whole purpose of the survey is to determine the relative location of all guns in all of the units with respect to the targets. This includes vertical control as well as horizontal control: that is, the relative elevation of all guns and targets must also be determined. The relative elevation of the piece and the target have a direct effect on the range.

Just as in planning any other operation, much depends upon the situation; and whenever an operation depends on the situation the

first step of planning should always be an estimate of the situation. This estimate of the situation is essential in all echelons before making the plan of survey. The factors that I believe should be covered in the estimate follow:

1. Time available for survey operations.—Does the plan of operations allow time for a complete detailed survey, or must the survey operations be restricted to only the bare essentials to gain centralized control? Whatever the plan of survey may be, it must be completed in time to support the operation.

2. The nature of the operation.—Is the front fluid or relatively stable? This will have a direct effect on the amount and type of survey necessary. With the nature of the operation should be included the type and amount of fires anticipated and the possibility of registration to obtain corrections.

3. Maps and existing control available.—If good maps are available common control is easily attained and very little survey is necessary; for the higher echelons this might necessitate only the announcement of coordinates and altitudes of check points for the lower echelons. With poor, inaccurate maps or only air photos available, a complete survey is necessary and the extra time required for this must be considered.

4. Personnel and equipment available.—This factor generally varies less than any of the others; however, the personnel and equipment available will have a great effect on time necessary to complete the survey.

5. Terrain.—The nature of the terrain cannot be overlooked; survey in a jungle is much more difficult and time consuming than survey over rolling open terrain. The method of survey is completely different in the jungle or very flat wooded terrain, where short, dog-legged traverses must be run, from that in open terrain where triangulation points can be seen from great distances. Nature of the terrain will even affect type of equipment necessary.

6. Weather and Visibility.—The greatest effect of weather and visibility is on the time necessary and the thoroughness of the survey.

All of these factors must be considered before a complete plan of survey can be made.

In any corps or division operation the corps commanders and division commanders must always consider the question of survey and the time necessary for the survey if an artillery preparation or any other phase of massed artillery fire is desired to support the operation. In some situations the time necessary for the artillery survey will be the controlling factor in initiating the operation. However, the time necessary for the completion of the survey varies so much for different situations that no estimate of the average time can be stated right here; but when the artillery survey officer has made his estimate of the situation, an accurate estimate of the time should be available. To make this estimate, then, it is necessary for the artillery commander and his survey officer to know the plan of operation at the earliest possible time so that a survey plan sufficient to support the operation can be made and an estimate of the time it can be completed rendered to the higher commander. Also, considering survey as a continuous process in artillery operations: plans for any future action, which the survey officer can attain, may save much time later by being previously prepared for the operation. In making survey plans, the survey officer must remember that he is not the only time controlling factor; the fact is that a perfect survey after the battle is over is useless, while a less accurate survey completed is much better than none.

For the purpose of illustration in following through survey planning and procedure, assume one of the harder situations: that is, a situation with no maps available and the only photos available being the verticals, recently taken by the Tactical Air Force, which will not be controlled in any way. An uncontrolled vertical or air photograph is a photograph that has not been corrected by use of a map or survey data for inaccuracies or distortion caused by camera tilt, relief of the terrain, and refraction. In such a situation, with time available, the firing chart would necessarily have to be built up on a

common grid system controlled entirely by survey. This situation requires more survey than any other, and if the principle of this type of survey is understood it will be easy to simplify it by the use of maps when they are available.

The largest unit generally interested in the survey plan and the largest unit of which the fires are generally massed is the corps; so the corps artillery officer would be the first to initiate an estimate of the survey situation and the first to initiate a survey plan as the situation directs. The object of

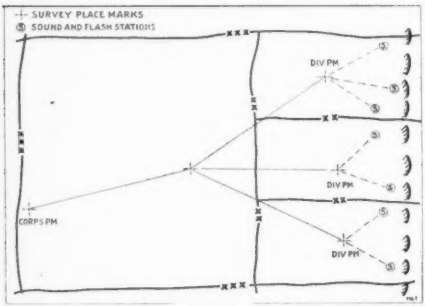


FIGURE 1.

his plan will be to assure common control by extending data on location, direction, and elevation of placemarks reasonably accessible to all corps artillery units and divisions in the corps. This would include a placemark with coordinates, a direction orienting line, and elevation for each division artillery headquarters in the corps and each artillery battalion of the corps artillery; and if further coordinated, it might include placemarks closer to the front for observation post and target area control of the lower echelons. The corps survey plan might also include the survey for the sound and flash stations of the observation battalion. (Figure 1.)

The personnel available will be variable. If the corps field artillery observation battalion is operating sound and flash stations and the engineer topographic company is not available, then the only personnel available to carry survey control to the subordinate units might be the topographic platoon (four traverse parties), of headquarters battery of the corps field artillery observation battalion, while in some situations the entire observation battalion plus topographic engineers might be available.

The control would be started from the most suitable control point of the army and carried forward. The corps topographic engineer company would carry the control to the field artillery observation battalion, and sometimes even to other subordinate artillery units, and the location of positions and points within the enemy lines. When no control data is available to the corps artillery headquarters, the observation battalion adopts its own arbitrary grid system to be used. This is generally done by using some readily identifiable terrain feature as an origin, assuming a set of coordinates and elevation for the point, and then assuming a direction, as close to the true direction as possible, to some other identifiable terrain feature. The survey is then carried on from this point just as if the data used were true data from a map or from a previously surveyed placemark.

Figure 1 shows control generally established by the corps echelon.

The corps survey officer should always inform subordinate echelons at the earliest possible opportunity of all information concerning:

1. Basic plan of survey, location of placemarks to be established, and how much control will be furnished by corps.

2. Maps or grids to be used.

3. Time at which control data can be expected by subordinate units.

4. Information on additional topographical data and availability of additional map substitutes such as air photos.

5. Location of corps survey information center and what survey data should be reported to the survey center.

The second echelon of survey is the division. After the corps plan has been disseminated to the division, the division artillery commander makes his estimate of the situation; and the plan of survey to be fol-

lowed by the division echelon is set up. The main task of the division echelon is to establish the survey control for the artillery battalions of the division, locate targets and check points in enemy territory, and locate artillery observation posts. If the division is

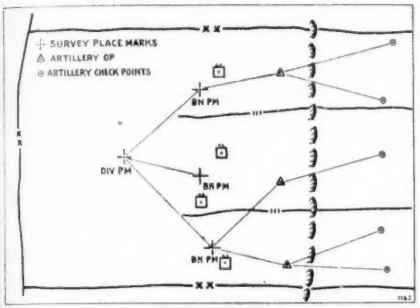


FIGURE 2.

operating alone or no centralized control is desired by the corps, the division will provide the data on the grid system to be used just as the corps did above and set up battalion placemarks using this grid system. Figure 2 shows control generally established by the division artillery echelon.

The artillery battalion is the third and last echelon of survey. The battalion's primary interest is in obtaining proper data for the construction of a firing chart which will permit accurate preparation of firing data and which will be tied in with the firing chart of the higher echelon. Their main task is in accurately locating the pieces, targets in the enemy territory, orienting lines accessible to the batteries, and observation posts. The orienting line used by the battery is a line of known direction which is staked out on the ground as it is surveyed in. This line is used by the battery to lay its guns for direction. The angle formed by a line drawn from the target through the base piece of the battery projected on to cross the established orienting line is computed at the fire direction center. This angle is sent to the battery where an instrument is set up on the orienting line, and using this angle the battery is laid on the target. Of course this is done only on the first target, or the base point as it is called; to fire on other targets the battery simply shifts from the base point by the required amount.

The artillery battery should not be considered a separate echelon in survey opera-

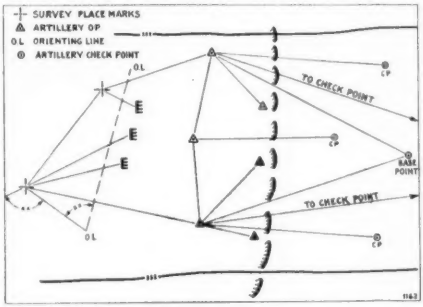


FIGURE 3.

tions; the battery does very little survey alone. Its main job is to assist the battalion in locating the base piece of the battery from a nearby placemark established by the battalion survey section. Figure 3 shows the control generally established by the battalion echelon.

The sequence of this illustration has followed the control sequence, and not the chronological one. Although the control starts from the higher echelon and does not reach the lowest echelon until much later, this does not mean that the artillery battalion waits until a placemark is established before starting survey. All echelons start survey immediately. The battalion starts from an arbitrary placemark with assumed data; then when the control from the higher echelon is made available, the completed survey is adjusted to tie in with that control. This arbitrary placemark selected by the battalion is generally one that can be surveyed in very easily by the next higher echelon, which would be the division artillery headquarters in the case of the organic artillery battalions of the division. When the battalion selects its starting placemark with the division survey echelon or immediately notifies them of the location, then, as soon as the di-

vision gets it surveyed in with the correct data, the battalion is notified and their data is corrected. The division echelon does the same; survey operations are started with assumed data and adjusted when the correct data becomes available from the corps echelon.

The actual procedure of completing an artillery survey is a technical operation and can be done in many different ways, all of which will arrive at the same solution if the work is accurate. The survey officers in all echelons must know the plan of operations early so that each can adapt the plan that gives the shortest and fastest approach to the solution. The procedure of locating all placemarks and gun positions in our own territory is the simplest part of the survey operation. The location of targets and check points behind the enemy's lines is somewhat more difficult. Except for the targets located by sound, flash, actual observation, or the radio position finder, the grid sheet must be supplemented by aerial photos. The hardest part of the survey is generally the location in the target area of control points that can be identified on the aerial photo so that targets, which have been located on the aerial photos by photo interpretation methods or by observers, might be restituted or transferred from the air photos to the grid sheet. Numerous points to be used for altitude control in transferring targets should also be located if accurate artillery fire is expected on targets located by air photos and transferred onto a firing chart.

In discussing survey, the subject of registration, that is, registering the piece for the latest corrections, should never be forgotten. Registration is the final touch of the survey, and without the opportunity to register no survey is complete. The meteorological correction, or metro correction as it is called, used in artillery fire direction is a very important factor, but it cannot take the place of corrections gained by registration; it only supplements or adds to them. Thus the process of registration by the artillery should seldom be prohibited if the necessity of accurate artillery fire outweighs loss of surprise that might be due to registration. Rather than be prohibited, it should be controlled and restricted. One gun per battalion is sufficient under most conditions, and this can be of just as much use if made from a temporary position and not the main battle position of any battery.

This has only been an outline of survey planning and the procedure necessary for a complete artillery survey. The principles of this survey are the same no matter where the operation may take place; whether in the jungle, on Pacific Islands, or on the open, rolling country of France, the objective will always be the same. Locate the targets relative to the artillery pieces and gain centralized control by coordinating all survey at the earliest possible time. However, as already mentioned, the procedure will vary greatly in each different operation; the situation is seldom the same for any two operations even if they happen to take place on similar terrain. An estimate of the time necessary for a complete survey can be made only after the artillery survey officer knows the current situation and the type of artillery fires required for the operation. No commanders or general staff officers should forget that one of the main time factors in planning operations is the time necessary for massed artillery support; and they should further remember that this time factor can be cut down by giving the artillery commanders early information, even though it might be only fragmentary information. If the information initiates survey earlier, it means earlier support by massed artillery fire.

The blow, wherever struck, must, to be successful, be sudden and heavy.

—General Robert E. Lee

Oversea Replacements—Personnel Accounting System

LIEUTENANT COLONEL JAMES M. EMIGH, *Field Artillery*
Military Personnel Division, Army Service Forces

AXIS COUNTERATTACK REPELLED
ALLIES CONTINUE RAPID ADVANCE

SO might read many a current-day headline. The present Oversea Replacement System of the Army of the United States is one of the reasons for such success.

From time immemorial, nations have engaged in armed conflict for reasons political, or territorial, or for personal or party aspirations for power. Even in Biblical days, or the days when knighthood was in flower, the pages of history might have been changed had either contestant had an efficient system for replacement, to units in combat, of losses as they occurred. In our own Revolutionary War, organizations or groups underwent great hardships and bitter conflict at greatly reduced strength without replacement of losses. During the Civil War, replacement was accomplished only by occasional reorganization of units withdrawn from conflict. Immediate replacement of losses to units in combat, by either side, might have influenced many battles.

During World War I, the furnishing of replacements was relatively simplified by the fact that combat was on only one front and that adequate port and training facilities were available in France. Even then, however, replacements were made intermittently and not at the same time losses were suffered by units in combat.

Great surprise and tremendous tactical advantage could be attained by nightly replacement of combat unit losses of the day with highly trained personnel of the proper Military Occupational Speciality to enable the unit to enter combat each day at full strength and maximum efficiency. The hostile force which counterattacked a unit badly battered the previous day, in anticipation of finding it greatly weakened, could meet only catastrophe under such a system.

At the time of the initial entry of United States Army Forces into combat in World War II, theaters of operation were given authorized strength in the form of tables of organization for units, and tables of allotments for overhead installations. Under the plan of oversea replacements originally in effect, the War Department assumed the responsibility for keeping the theaters up to authorized strength and capable of effectively accomplishing their respective missions. As a means of implementing this responsibility, the War Department authorized in each combat theater a depot stock which provided for either (1) a stockage of maximum percentage of strength or (2) stockage to cover losses for a specified period in months, the smaller of the two stockages to be used. This plan resulted in a situation under which theaters requisitioned, based upon their desires, but with no direct control exercised over them by War Department, and with the flow of replacements being governed by theater demands.

In early 1944, when the troop ceiling was reached and induction quotas were leveled off with a view to induction of only such numbers of personnel as would be required for replacement of losses in order to maintain troop ceiling, it became impossible for Zone of Interior pools to fill requisitions for replacements in the amounts requested by theaters, which in many cases were in excess of actual losses.

At this time the delicacy of the situation which was arising was realized, as well as was the necessity for positive control over theater strength against authorized strength and of depot stockage. For the first time, it became evident that priority of distribution must necessarily be an essential part of the replacement system and that a standard reporting system was necessary in order that the theaters and the War Department would be on a standard basis for the requisition of replacements and the filling of requisitions.

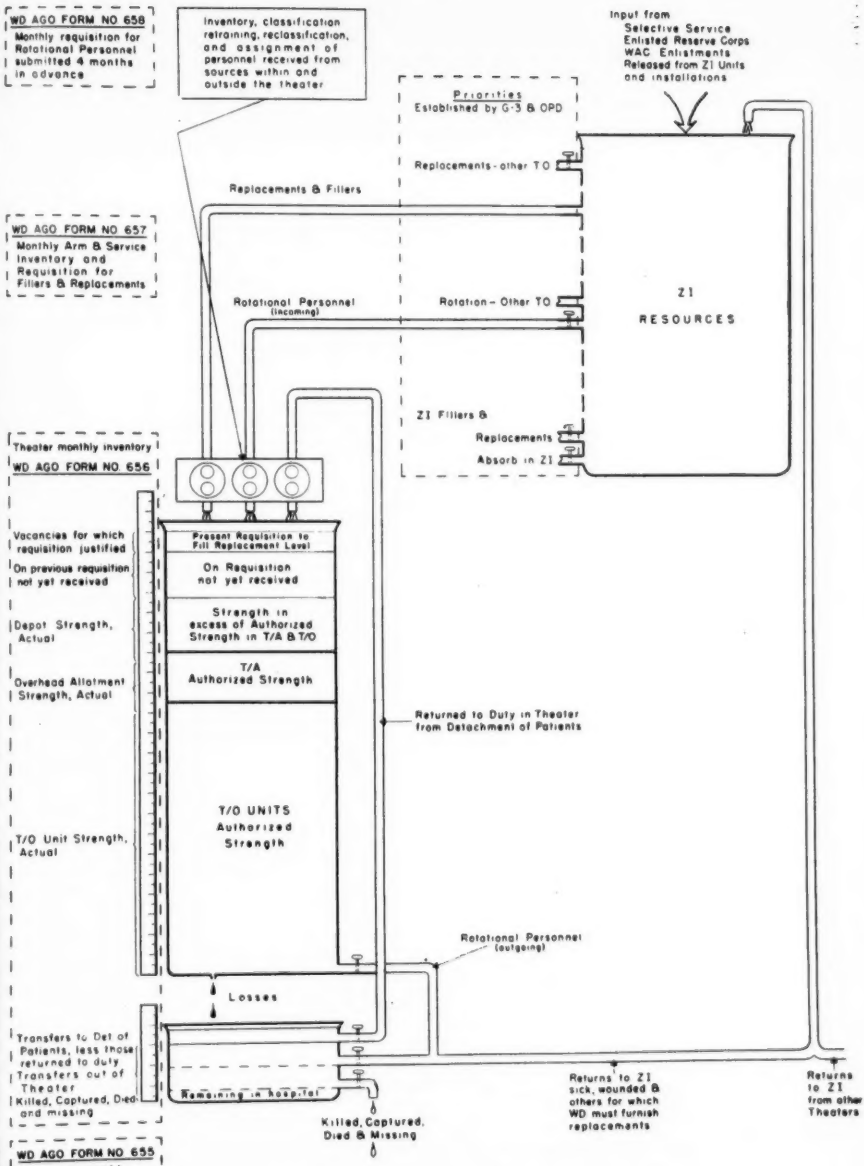
During the early part of 1944, the War

Department undertook a thorough study of the situation then existing in active theaters, in which a considerable overstrength existed and among which there was a surplus of personnel which could not be placed within the theater. This study presented an opportune time for consideration by the War Department General Staff of a proposed new Personnel Accounting System. In order to meet the ever-growing problems of furnishing qualified personnel in the numbers required by oversea forces for replacements, and in order to apply the experience gained in the study of the situation existing in active theaters, particularly to impending operations in the European Theater, a new Personnel Accounting System was studied by the War Department General Staff, reviewed by representatives called to the War Department from two of the major theaters, and was adopted by the War Department with minor changes.

In May 1944, a War Department directive was issued establishing a uniform Personnel Accounting System under restricted letter AG 320.2 (13 May 44) OC-E-SPGAR, 15 May 1944, subject: Oversea Replacement System—Estimates, Reports, and Requisitions, to Commanding Generals, Oversea Theaters and Bases, Defense Commands, and Departments. The first reports under the new system were submitted in June as of 31 May 1944. On 20 June 1944, War Department General Staff Circular No. 11-3, Military Personnel, Replacement System, was published for the purpose of clarifying responsibilities in the implementation of the Replacement System, and to provide procedures for the effective execution of these responsibilities. On 31 July 1944, War Department Circular No. 317, Oversea Replacement System, was published as a revision of War Department Memorandum No. W600-72-43, Oversea Replacement System, in order to clarify such matters as: responsibilities for the furnishing of replacements for oversea forces; detailed instructions in regard to the preparation and submission of theaters of operations estimates, reports, and requisitions; the defining of "replacements," "fillers," and "rotational personnel"; detachment of patients; replacement depots in oversea theaters and in Zone of Interior; the formation of casual detachments for shipment; and a standard listing of Arms or Services.

The new Personnel Accounting System is of a highly statistical nature, but can best be explained as schematically depicted in Figure 1 and by following the procedure as indicated in the schematic diagram. Each theater has been given authorized strength of Table of Organization Units and authorized strength of Overhead Allotment in the form of Tables of Allotment. Against these authorized strengths, there will be certain losses such as killed, captured, died, missing, and transfers to Detachment of Patients, less those returned to duty, as well as transfers out of the theater. Of total losses, a certain proportion can be salvaged or skimmed off the vat receiving losses and returned to duty in the theater through a meter which represents the Replacement Training Command in the theater in which inventory, classification, retraining, reclassification, and assignment of personnel received from within and outside the theater are accomplished. Another portion of losses represents returns to Zone of Interior of sick, wounded, and others for whom the War Department must furnish replacements, and many of whom will be sent through the Zone of Interior pipeline back into the Zone of Interior Resources Pool. Still other losses are realized in the form of outgoing personnel returned to Zone of Interior, many of whom are likewise returned to Zone of Interior Resources Pool.

The Zone of Interior Resources Pool, in addition to being partially filled by returns to Zone of Interior of sick, wounded, and others and return of rotational personnel, is further filled by input from Selective Service, Enlisted Reserve Corps, WAC enlistments, and personnel released from Zone of Interior Units and installations, in order to make up total Zone of Interior Resources for replacement purposes. The flow of replacements into and through the Zone of Interior Pool and to theaters is as indicated in Figure 2.


WD AGO FORM NO 658
Monthly requisition for Rotational Personnel submitted 4 months in advance
Inventory, classification retraining, reclassification, and assignment of personnel received from sources within and outside the theater
Input from
Selective Service
Enlisted Reserve Corps
WAC Enlistments
Released from ZI Units and installations
Priorities
Established by G-3 & OPD
Replacements - other TO
Replacements & Fillers
WD AGO FORM NO 657
Monthly Arm & Service Inventory and Requisition for Fillers & Replacements
Rotational Personnel (incoming)
Rotation - Other TO
ZI
RESOURCES
ZI Fillers &
Replacements
Absorb in ZI
Theater monthly inventory
WD AGO FORM NO 656
Present Requisition to Fill Replacement Level
On Requisition not yet received
Strength in excess of Authorized Strength in T/A & T/O
T/A
Authorized Strength
Vacancies for which requisition justified
On previous requisition not yet received
Depot Strength, Actual
Overhead Allotment Strength, Actual
Returned to Duty in Theater from Detachment of Patients
T/O UNITS
Authorized
Strength
T/O Unit Strength, Actual
Rotational Personnel (outgoing)
Losses
Transfers to Det of Patients, less those returned to duty
Transfers out of Theater
Killed, Captured, Died and missing
Remaining in hospital
Killed, Captured, Died & Missing
Returns to ZI sick, wounded & others for which WD must furnish replacements
Returns to ZI from other Theaters
WD AGO FORM NO 655
Theater monthly Estimate of Losses (All reductions in strength for which the WD must furnish replacements)

OVERSEA REPLACEMENTS

(1249)

Personnel Accounting System

FIGURE 1.

The Personnel Accounting System revolves around four forms on which monthly reports are submitted. Each of these forms will be discussed briefly.

WD AGO Form No. 655, Theater of Operations, Estimate of Replacement Requirements, provides monthly an estimate of replacement requirements for each month for the six months, beginning with the month following date of preparation. This estimate includes all reductions in strength for which the War Department must furnish replacements. Radio and written reports are submitted on the fifth day of each month. Estimated losses, other than filler and rotation, are, after adjustment by the War Department General Staff, tabulated in the form of total bodies by Arm or Service for each theater and in total. After further adjustment by Arm or Service by the War Department General Staff, Zone of Interior losses as well as filler and rotational requirements are added. A final tabulation of Military Occupational Specialty by Arm or Service, by Army Air Forces, Army Ground Forces, and Army Service Forces, using theater and Zone of Interior Standard Rate Tables, is completed. Theater Standard Rate Tables used for this purpose are revised quarterly by each theater based upon theater retraining, reclassification, and up-grading capabilities, and are applied during the first three months for procurement and input to training centers and during the second three months for requisition and for shipment. The final tabulation then serves as a basis for procurement, training, requisition, and shipping against a projected estimate of requirements.

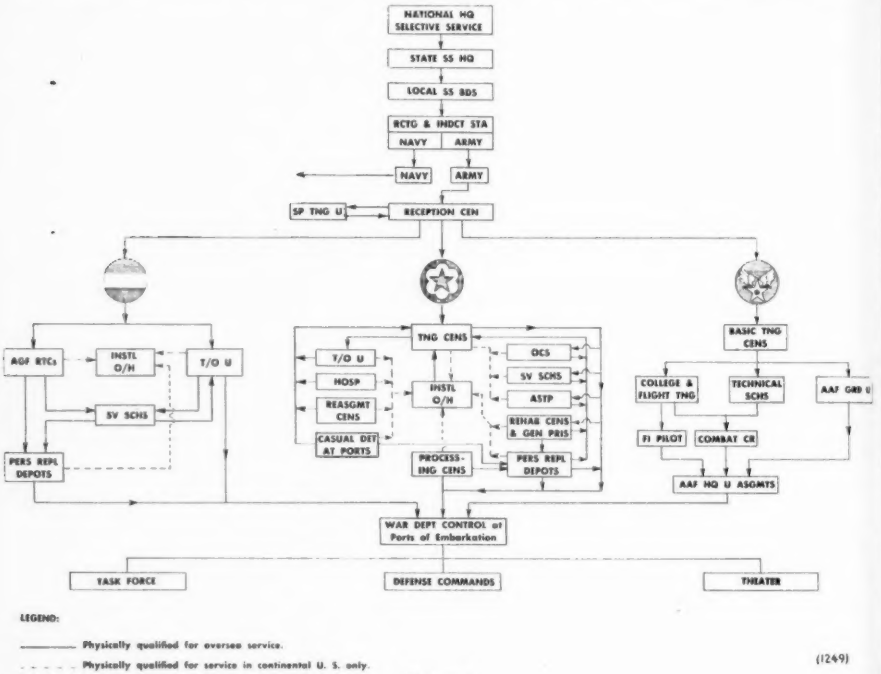


FIGURE 2.

An additional authorization of strength is

allotted by the War Department to each theater in the form of a Replacement Level, to provide for necessary personnel to meet anticipated losses in Table of Organization Units and Overhead Allotment and to provide for personnel rendered ineffective while in transit between assignments, and, when the situation demands, a stock of reserve strength in excess of anticipated losses. The authorized replacement level for each theater is announced monthly by the War Department and consists of depot stockage in the amount of approximately one month's losses, personnel on previous requisition en route in the amount of approximately one month's losses, and vacancies for which current requisition is justified in the amount of approximately one month's losses.

WD AGO Form No. 656, Theater of Operations, Personnel Replacement Status Report, is submitted monthly by radio and mail on the fifteenth of each month. It provides an actual measurement against authorized strength of Table of Organization Units, Overhead Allotment, and Replacement level of the actual strength of Table of Organization Units, Overhead Allotment, depot stockage, and personnel previously requisitioned not yet received, resulting in a summary analysis of vacancies of personnel not previously requisitioned and provides further an analysis of increases and decreases in strength during the month.

WD AGO Form No. 657, Theater of Operations, Requisition for Fillers and Replacements and Inventory of Personnel by Arm or Service, is submitted by radio and mail monthly on the fifteenth of each month. It provides an inventory of personnel by Arm or Service against total vacancies for last day of previous month as arrived at on WD AGO Form No. 656. Also, it provides a requisition for fillers and replacements, with supplements which provide a more detailed requisition by Specification Serial Number or Military Occupational Specialty, by Arm or Service, white and negro separately.

WD AGO Form No. 658, Theater of Operations, Requisition for Rotational Personnel, is submitted by mail monthly on the first of each month. It is a requisition for rotational personnel submitted four months in advance, by Arm or Service, Military Occupational Specialty, grade, and destination. This requisition agrees in grade and Military Occupational Specialty with the personnel who will be returned from the theater on rotation upon receipt of personnel requisitioned.

Upon receipt of the radio reports of the first three forms discussed, WD AGO Form Nos. 655, 656, and 657, an analysis is made of:

1. authorized strength, actual strength, replacement level, and vacancies by theater and consolidated; analyzed against

2. overage or shortage, depot strength, personnel previously requisitioned, and requisitions against current vacancies by theater and consolidated.

An additional analysis is made of:

1. personnel available from Replacement Training Centers, by Arm or Service, as reported by Army Air Forces, Army Ground Forces, and Army Service Forces, projected for a period of two months by weekly availability and an additional four months by monthly availability, less commitments, to determine net availability cumulative; analyzed against

2. a tabulation of current requisitions by Arm or Service of each theater and total for all theaters.

These analyses are then studied by War Department General Staff for final adjustment and for the establishing of priorities in which the requisitions of the various theaters of operation will be filled. Directives are then issued to Army Air Forces, Army Ground Forces, and Army Service Forces for shipment through pipelines representing Oversea Replacement Depots and Ports of Embarkation, through meters representing Replacement Training Commands in oversea theaters, where inventory, classification, retraining, reclassification, and assignment of personnel received from sources within and outside the theater are handled and through which assignments are made to Table of Organization Units and Overhead Allotment to maintain authorized strength.

XUM

Upon receipt of WD AGO Form No. 658 on the seventh of each month, a consolidation is made, by Military Occupational Specialty and grade, of rotational personnel for four months in advance and is submitted to the War Department General Staff for adjustment, then in consolidated form to Army Air Forces, Army Ground Forces, Army Service Forces. Directives are then issued to the three major forces for shipment through a pipeline representing Oversea Replacement Depots and Ports of Embarkation, and in turn through the meters representing the Replacement Training Command in the theater, through which assignment is made to units.

Under this system, it is possible to estimate replacement requirements, projected seven months in advance, by Military Occupational Specialty, so that input for training is on the same basis as requisitions submitted by theaters for replacement personnel, with the final result that replacements are furnished to theaters in the Military Occupational Specialty in which they were requested and in which they are needed for replacement purposes.

Food in the Burma Jungles

From an article in *The Bulletin of the U. S. Army Medical Department* October 1944, reprinted from a special report, Office of War Information.

THE jungles of Burma offer a great variety of foodstuff—fish, fruits, vegetables, roots, bulbs, wild honey, game birds, and meat from wild animals. Food may be obtained at any time of the year. In the fall when acorns and chestnuts are ripe, wild pigs gather in the valleys and plains in great numbers. In the hills when the rice is ready to cut, they visit the fields at night and can be easily shot. The pig is one of the swiftest and most dangerous of wild animals. When encountered on a path or a hillside, it is best not to shoot, as he will make a sudden charge and it is almost impossible to get out of his way. The young pigs, which are the best eating, are not dangerous.

Barking deer, one of the best game animals, are found everywhere and can be decoyed by blowing on a leaf to imitate the fawn.

The serow is so inquisitive that it stops and looks at every sound. This large animal is good to eat. They have a sharp, bark-like call which can be heard at night when they are alarmed. Once a trail is found they can be easily tracked.

The porcupine is the best food animal of the jungles and one of the easiest to obtain. It uses beaten trails which lead for miles from its hole. The best way to shoot these animals is to wait along the trails with a torch at which they will stare. The best time to hunt is during the dark of the moon.

The tree civet is like the raccoon and lives entirely on fruit. They can be decoyed by making a sucking noise on the palm of the hand. When a torch is used, they will stare at the light. A banyan tree in full fruit is the most certain place to find them.

The black tree squirrel, which is about the size of a large hare, has a tail about two feet long. It may be seen jumping about in high trees and can be attracted by the noise made by sucking on the hand. It will chatter and thrash its tail from side to side, giving time to shoot.

The flying squirrel is never seen in the daytime, as it lives in holes and not in nests like other squirrels. It is decoyed by the same method as the palm civets. It will stare at a torch for a long time without moving. These animals make a terrifying noise which may be mistaken for that of a leopard. The bark around the hole where they live is usually gnawed; by beating on the tree trunk, one can get them out in the daytime.

Hares are found only in the plains. The natives make a screen behind a light at night to conceal themselves. They rattle some small stones and the hares hop along toward the light.

Functions and Operations of G-4 Division, North African Theater of Operations

LIEUTENANT COLONEL WENDELL E. LITTLE, *General Staff Corps*

This article was prepared under the direction of Brigadier General C. L. Adcock, GSC, who was AC of S, G-4 of NATOUSA and also Senior American on Supply of AFHQ. He is now G-4 of the Sixth Army Group.—THE EDITOR.

I. BACKGROUND

1. SHORTLY after the invasion of North Africa by American troops in November 1942, elements of Allied Force Headquarters (AFHQ) began to move from the United Kingdom to North Africa. By the end of that year General Eisenhower had organized a combined headquarters in Algiers that operated as a Theater Headquarters for the American troops and a General Headquarters (GHQ) for the British troops. The organization continued in this form until 4 February 1943, when Headquarters NATOUSA was established by War Department order. General Eisenhower was both the Commander-in-Chief of AFHQ and the Commanding General, NATOUSA. Prior to the establishment of Headquarters NATOUSA, two United States base sections had been established at Casablanca in Morocco and at Oran in Algeria, known as the Atlantic Base Section and the Mediterranean Base Section respectively. The Mediterranean Base Section had an advance section at Constantine, Algeria, which later became the Eastern Base Section.

2. During the early months of 1943, the United States increment of AFHQ performed the functions of a United States Theater Headquarters, including the activities which, according to the Field Manuals, were normally assigned to a Headquarters, Communication Zone. Shortly after establishment of Headquarters NATOUSA, the need for a separate headquarters to coordinate the activities of the base sections was recognized and on 15 February 1943, the Services of Supply, NATOUSA, was activated by NATOUSA to supervise the supply activities of the base sections and to assume responsibility for supply of the United States forces in the theater. The functions of the Communications Zone, NATOUSA, were delegated to the Commanding General, Services of Supply, by NATOUSA General Order No. 12, dated 24 February 1943.

3. The establishment of the Services of Supply, NATOUSA, had a direct effect upon the functions and activities of the G-4 Division of Theater Headquarters since this new headquarters assumed responsibility for supply of the United States troops in the theater. The strictly U. S. supply functions of Theater Headquarters were limited to policy making, advance planning, and advice to the Commanding General of the logistical capabilities of the forces. There were, however, many logistical problems of an allied nature that required a considerable staff at Theater Headquarters.

4. Because of the nature of operations in the theater, it was necessary to handle many problems which arose in connection with the U. S., British, and French forces on the AFHQ-NATOUSA level. With United States, British, and French forces fighting side by side against the common enemy, it was necessary to integrate supply procedures to insure the most efficient utilization of port and transportation facilities required for support of the armies.

II. ORGANIZATION OF THE G-4 DIVISION, NATOUSA

1. The personnel of the G-4 Division, NATOUSA, wore two hats. The Division was manned under a NATOUSA allotment of personnel to perform the G-4 functions for the theater. These same officers also acted as the United States increment of the G-4 Division of AFHQ. The Assistant Chief of Staff, G-4, NATOUSA, also held the appointment as G-4 of AFHQ and in this latter

capacity he had a Deputy G-4 (British) who controlled British supply activities. The details of routine supply procedure for the United States troops in the theater were the responsibility of SOS NATOUSA and the base sections. The principal functions of the officers in the G-4 Division of AFHQ-NATOUSA were concerned with Allied supply problems. These problems were the result of a combined operation of United States, French, and British forces in the same theater, being maintained in some cases over the same line of communication and fighting on a common front.

2. The G-4 Division was organized into five sections as follows:

a. Supply and Evacuation.—The principal functions of this section were the formation of supply and evacuation policies for the theater, recommendations on the requests for issue of items in excess of T/BA or T/E, and coordination with appropriate British staff sections where there were possibilities of conflict in supply procedure. This section also supervised lend-lease and reverse lend-lease policies and procedures. Operational procedures for the evacuation of patients by air from the combat zone to the Communication Zone were initiated and developed on the AFHQ-NATOUSA level. This was necessary because of the Allied interest in this type of evacuation.

b. Organization Section.—This section was responsible for recommendations on the allotment of service troops between the armies and the Communication Zone (SOS NATOUSA), recommendations for formation or disbandment of service troops, estimation and computation of service troops required to support the plans and operations of the theater commander, and recommendations to the War Department for additional service troops required to support additional United States troops coming to the theater.

c. Plans Section.—The campaigns conducted in the North African Theater were characterized by their amphibious nature. No sooner was one amphibious operation well ashore than plans were commenced for an amphibious assault on some other objective in the theater. Officers of the Plans Section were members of the Executive Planning Section of AFHQ, which was an Allied interservice planning group charged with the task of examining and preparing in detail plans for future operations that might be undertaken by the theater commander.

d. Civil Section.—The Civil Section worked in close coordination with the Military Government (later called G-5) Section and was concerned with the importation of essential civilian requirements and the balancing of civilian requirements against military needs.

3. Construction Section.—The Construction Section was responsible for advice in connection with construction projects and standards of accommodations.

III. Special Types of Problems in NATOUSA

1. As indicated above, the functions of G-4 Division of NATOUSA were characterized by the Allied nature of the operations. The senior Allied commander in the theater was the Commander-in-Chief of AFHQ. General Eisenhower was the original Commander-in-Chief until January 1944, when General Sir Henry Maitland Wilson (British) assumed command. After General Eisenhower left AFHQ to assume Supreme Command of the Allied Forces in England, Lieutenant General Jacob L. Devers assumed command of NATOUSA and acted as the Deputy Commander-in-Chief of AFHQ under General Wilson. General Devers acting in his capacity of Commanding General of NATOUSA retained final control of all U. S. supplies and equipment in the theater even though the actual military operations were under the command of AFHQ. This authority was essential in order to prevent the dissipation of U. S. supplies on unauthorized projects. The Commander-in-Chief, AFHQ, determined the strategic policies of the theater which were carried out by United States or British forces, supplemented by such other United Nations' forces as were available. While identical operations were undertaken by United States and British forces, it was not

possible to completely amalgamate the United States and British supply systems.

2. There are well established methods for our allies to procure supplies from the United States under authorized lend-lease procedure. Each of our major allies established offices in Washington for this purpose. There was also a continuous effort in the theater on the part of our allies to supplement supplies of United States origin from United States theater stocks. In a like manner, United States units found it convenient to draw certain common items of supply from Allied depots. The result was a displacement and unbalancing of stocks, since the War Department shipped to NATOUSA only those stocks approved on the basis of United States strength in the theater. In order to alleviate this problem, the guiding principle was agreed that each nation should be responsible for the maintenance in all respects of its own units from its own sources. On this basis, the supplies secured by the British in the United States through lend-lease channels were considered a British source, since such did not affect United States theater stocks directly.

3. The rule was established at AFHQ that transfers of equipment and supplies between British and United States units in the theater could be made only on authority of Theater Headquarters. In this manner the G-4 Division, NATOUSA, acting as the United States increment of the G-4 Division, AFHQ, would approve or disapprove requests for transfer of United States stocks of equipment and supplies desired for use in British or British maintained formations. In cases where transfers of equipment and supplies were approved, the transfer was made under local lend-lease procedures whereby the Finance Officer reported periodically to the War Department on the value of the items so transferred.

4. An important problem in connection with combined operations in the Mediterranean Theater was the division of occupied territory into two parts for use as a Line of Communication for British forces and a Communication Zone for United States forces. The actual division of specific territory was agreed by the proper United States and British officers at AFHQ following the principle that the supporting troops should be directly behind the combat troops of the nationality concerned. Having divided the occupied territory into two zones, the guiding principle was that when a unit of one nationality was necessarily located in an area controlled by the other nation, it would adjust its activities to conform to the policies of the controlling agency. Items of local administration, including local accommodations, provision of utilities, sanitation and hygiene, local traffic control, etc., were always the responsibility of the nation in whose area the installation was located. Items of general administration and discipline were always a responsibility of the nationality concerned.

5. At the ANFA conference at Casablanca in January 1943, it was agreed between President Roosevelt and Generals Giraud and De Gaulle that a French Army would be raised in North Africa and equipped with the latest weapons of war to be supplied by the United States. Prior to that time the 19th French Corps had fought well in Tunisia with inadequate equipment supplemented by such maintenance as could be provided on the spot from United States or British resources. The French rearmament program was later approved by the Combined Chiefs of Staff who control major world-wide allocations of equipment. The actual day by day supervision of the rearmament program insofar as the theater was concerned was the responsibility of the Joint Rearmament Committee, NATOUSA. This agency was in fact not a committee but was organized along normal functional lines as a separate section of NATOUSA.

6. The equipping of a French Army in North Africa with United States equipment was an activity with which the G-4 Division of the theater was vitally concerned. Matters relating to organization of service troops to support the French Divisions were a concern of the Organization Section of G-4 Division and matters relating to equipment and supply

of the French Forces were a prime concern of the supply and evacuation section of G-4. The lack of adequate trained personnel in Africa made it extremely difficult for the French to organize sufficient qualified service troops to support all the French combat troops that could be put in the field.

7. Once the French divisions were equipped and ready for combat, it was obviously impractical to establish separate depots and Lines of Communication for the French Forces since they were equipped with United States equipment following closely the T/BA and T/E of United States units. After negotiation with the French High Command and approval by the War Department, a system was adopted whereby French forces operating as a part of a United States force would be supplied and maintained on substantially the same basis as United States Troops. This necessitated the development, importation, and distribution of a special Moslem ration since the Moslems, who constituted almost half of the French combat troops, would not eat the pork ingredients of the ration. Certain French supply personnel were integrated into the United States base sections which were responsible for the supply of the United States and French forces in combat. In this manner the French supply requirements were handled by French personnel insofar as practical.

8. Under normal conditions the supply of Class III products is the responsibility of the Quartermaster. In the North African Theater the shortage of gasoline storage facilities, combined with the fact that British and United States petroleum resources were pooled for the duration of the war, made it advisable to handle Class III products on an AFHQ level. A petroleum section of AFHQ was established which operated as a special staff section under G-4 controlling the import, storage, and distribution of all petroleum products. All stocks of petroleum products constituted a common pool for military requirements and for such civilian use as might be approved from time to time. A system was devised for estimating the consumption of British, United States, or French Forces on the basis of the number of vehicles in use by such forces and appropriate charges were made under lend-lease or reverse lend-lease procedures. Coal was handled similarly as a common item as its importation came from various sources both American and British.

9. Although only limited local resources were available in NATOUSA, it was desirable to coordinate and exercise general supervision over purchases and procurement made by or for United States and British forces. For this purpose a General Purchasing Board was established composed of British and United States officers to advise G-4 on policies and procedures relating to local procurement. Items of local manufacture or production were procured by the board and allocated among the military forces in the theater on the basis of needs.

10. During the invasion and occupation of North Africa, Sicily, Italy, Corsica, and Sardinia, the major factor limiting the scale of Allied military effort was port capacity. This factor was fully recognized by both the enemy and United Nations. The Germans went to considerable pains in an attempt to completely destroy the ports of Bizerte, Palermo, Naples, Leghorn, and Marseille, necessitating the diversion of considerable resources for the repair and rehabilitation of these ports. It was an important function of G-4 to allocate port capacity among the Allied military users.

11. In the same manner that port capacity in Africa, Sicily, and Italy was required for use by both United States and British forces, so were the railroad facilities needed for the onward movement of supplies from the ports to the combat troops of both nations. This necessitated the establishment of an agency to develop, rehabilitate, and operate the railroads. For this purpose a Director General of Military Railways was appointed to be responsible for the direction and operation of all railroads that could be used for military purposes. American and British troops were placed at the disposition of the Director General of Military Railways in proportion to the amount of traffic handled. The tonnage

to be hauled for each nationality was determined by allocations made at periodical bid meetings at which the requirements of the various forces were analyzed.

12. The supplies required by Air Forces operating in NATOUSA required a considerable proportion of available tonnage. The Communication Zone was responsible for the supply of common items for the Air Forces. The adjustment of service troops between the air and ground forces in the theater was the subject of continual study by the G-4 Division.

13. Another special problem of the G-4 Division NATOUSA was civil supplies. Normally civil supplies in the rear areas would not be the direct concern of a theater headquarters. In the case of NATOUSA, since port capacity was the factor limiting the scale of military operations, the tonnage required for essential civilian needs was a reduction in the supplies available for military purposes. The theater commander was responsible for the procurement and distribution of minimum essential civil supplies. This responsibility was delegated to the Military Government Section of the theater staff (later G-5) which section worked in close coordination with G-4 and the special staff sections in order to insure that civil needs caused the minimum loss to military requirements.

14. One of the principal functions of the G-4 Division was the allocation of tonnage between the various United States users in the theater. A tonnage allocation was sent each month by the G-4 Division to the New York Port of Embarkation through Headquarters, SOS NATOUSA, giving an allocation of United States tonnage for the month commencing 90 days in advance. The British followed a similar procedure. The United States tonnage allocation made the following breakdown in order to assist the Zone of the Interior in planning and execution of the necessary shipments:

a. Maintenance—common items of supply for the ground and air forces. (Classes I, II, and V based on the number of troops involved.)

b. Special allocation of tonnage to cover importation of the latest models of Ordnance equipment needed to replace worn out equipment.

c. Packaged petroleum products (bulk petroleum was imported by tankers which did not compete with the berthing space used by cargo ships).

d. Civil supplies. (Detailed breakdown furnished by the G-5 Section.)

e. French rearmament supplies.

f. Air Corps technical supplies.

g. Pierced steel planks (for air field construction).

h. Any other special items. (Class IV.)

In those cases where the total tonnage requested by the using service exceeded the estimated capacity of the ports for the month in question, it was necessary for G-4 to effect reductions in either the British or United States tonnage estimates and to allocate the available port capacity in accordance with military requirements.

IV. Conclusion

The functions and operations of the G-4 Division in NATOUSA were characterized by features peculiar to this theater and much of the experience gained would not necessarily apply to other theaters. This was due primarily to the different nationalities involved and to the methods of administration and supply peculiar to the Mediterranean area. The experience gained will be of benefit in similar situations in other theaters. Certainly, it was a broadening experience for the personnel involved, especially as regards the knowledge gained on methods of supply and administration in the British and French armies and the logistical planning which preceded the many joint-Allied amphibious operations which characterized the operations in the Mediterranean Theater.

Air Force Ammunition and Its Supply

LIEUTENANT COLONEL ROBERT S. MUNFORD, JR., *Ordnance Department*
Instructor, Command and General Staff School

THE success of air operations is directly dependent upon two factors: first, the ability of our aircraft to move vast quantities of ammunition and to discharge it so that it will strike an enemy objective; second, the ability of this ammunition to provide a maximum amount of destruction to this objective.

The design of air force ammunition has been based on this principle of providing maximum destructive effect for its payload or weight. In following this principle it has been found that all types of enemy targets cannot be destroyed with equal effectiveness by the same type of aerial missile and this factor has led to the design of a large number of different types of air force ammunition. This is particularly true of the aerial bomb, the principal offensive ammunition of the air forces.

The aerial bombs most commonly used by our air forces are of four general types—fragmentation, demolition, armor-piercing and incendiary. The fragmentation bombs are designed to project a large number of metal particles in all directions at a very high velocity. They are being used effectively in attacks against personnel and vehicles, and have given very excellent results in attacks on aircraft on the ground. The 20-pound fragmentation bomb was the standard size bomb at the beginning of this war and is still used extensively. It is equipped with either a tail fin for dropping from high altitudes or a parachute for low altitude attacks. The parachute serves to keep the bomb in the air until the aircraft can remove itself from the vicinity of the spray of fragments and also permits the bomb to touch the ground in a vertical position so that the fragments will be evenly dispersed in all directions. At a distance of sixty feet the fragments from this small bomb will penetrate almost any part of an aircraft except the heavy metal parts of the engine or wings. Several new and larger types of fragmentation bombs have been recently developed to give larger fragments at higher velocities.

Another bomb useful for its fragmentation effect is the 4-pound antipersonnel bomb. Quantities of these explosives are clustered in a light case for efficient suspension in the bomb bays of aircraft. These cases are dropped as a normal bomb and are opened at a predetermined distance from the ground by an explosive charge. This explosive charge disperses the individual bombs over a wide area.

Although all bombs have their specific usages the majority of air force ammunition supply is composed of demolition or high explosive bombs. These bombs are now called general purpose bombs because of their wide employment, but we find that their fuzing is of particular importance in making them effective in attacking each type of target. Our general purpose bombs are designed primarily for their demolition effect and are produced in five sizes: i.e., 100-pound, 250-pound, 500-pound, 1,000-pound, and 2,000-pound. Each of these bombs is normally composed of five parts: the bomb body, the tail, a nose fuze, a tail fuze, and an arming wire. The body is composed of an explosive mixture surrounded by a heavy steel case designed to withstand the shock of a high velocity impact and to achieve desired penetration without breaking open. The tail gives the bomb its ballistic qualities which allow it to be aimed at the target, and the fuzes detonate it in accordance with their predetermined selection or setting. There are many types of fuzes now in use and continued developments are being made. They must be carefully selected both considering the type of attack, such as minimum altitude or high altitude, and the type of target, such as lightly constructed aircraft hangars or industrial buildings of reinforced concrete.

In addition to the general purpose series of bombs there is the 4,000-pound light case bomb better known as a "block buster." This

bomb was developed for its tremendous blast effect and is used on industrial targets.

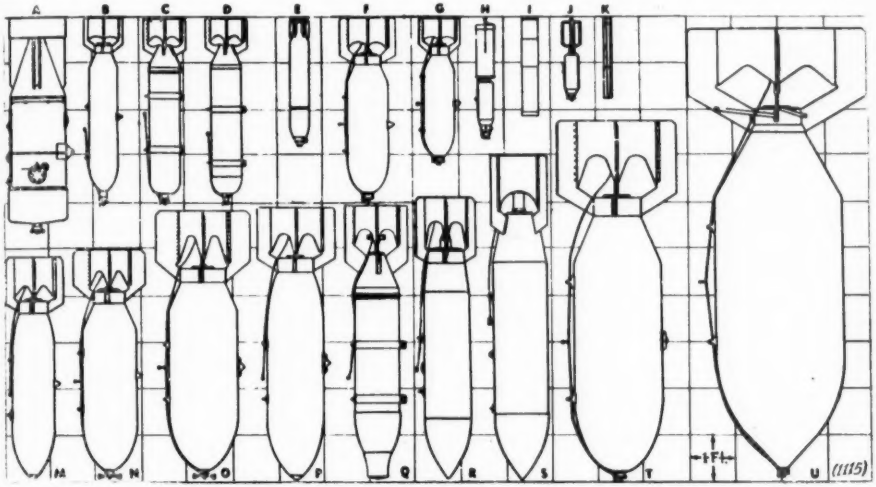
The armor-piercing and semi-armor-piercing bombs have been developed for the penetration of the deck armor of warships and also are being used for attacks against concrete emplacements.

Incendiary bombs are of many types and sizes. Several types of incendiary mixtures have been developed, the most frequently used being magnesium, thermite, jelled gasoline, and several of the pyrotechnic mixtures. These bombs vary in size from a few pounds to half a ton. The smaller incendiary bombs are clustered in a cylindrical case for efficient suspension in aircraft bomb bays and to give them ballistic properties necessary for hitting a specific objective. Like the antipersonnel bomb this cluster is opened by an explosive charge at a predetermined distance above the target, dispersing the individual bombs over the target area. Incendiary bombs are usually employed in conjunction with high explosive bombs to prolong the effects of their initial destruction. They are being used in large quantities in most of our theaters of operations and have been especially effective in attacks on industrial areas.

Inasmuch as bombs loaded with persistent chemicals have not been used in this war, the smoke bomb is the principal missile in this category. These bombs have been used in laying smoke screens in several operations. Smoke screens have also been laid by spraying the chemical smoke mixture from low-flying aircraft.

Several other aerial missiles used by our Army Air Forces have been developed by the Navy. These include depth bombs for attack of underseas craft, aerial torpedoes for attacks against war ships, and aerial mines for neutralizing enemy harbors or waterways and subsequent destruction of shipping.

In addition to our ammunition dropped from aircraft, there is a wide assortment of machine-gun and cannon ammunition nec-



A. Bomb, depth, 325-lb.
B. Bomb, 115-lb.
C. Bomb, photoflash
D. Bomb, chemical, 100-lb.
E. Rocket, 4.5 inch
F. Bomb, G. P., 250-lb.
G. Bomb, G. P., 100-lb.
H. Bomb, fragmentation, 23-lb.
I. Bomb, photoflash, M23
J. Bomb, fragmentation, 20-lb.
K. Bomb, incendiary, 4-lb.
M. Bomb, S. A. P., 500-lb.
N. Bomb, G. P., 500-lb.
O. Bomb, G. P., 1000-lb.
P. Bomb, S. A. P., 1000-lb.
Q. Bomb, A. P., 1000-lb.
R. Bomb, A. P., 1000-lb.
S. Bomb, A. P., 1600-lb.
T. Bomb, G. P., 2000-lb.
U. Bomb, light case, 4000-lb.

EXAMPLE OF ARMY AIR FORCE AMMUNITION

essary to give our aircraft protection from enemy fighters and for destruction of enemy ground targets. The caliber .50 aircraft machine gun with its armor-piercing, incendiary, and tracer ammunition is one of the most outstanding weapons of this war. It has proved effective against enemy aircraft, personnel, and a wide assortment of ground targets. In addition to this weapon we have the 20-mm, 37-mm, and 75-mm cannon each with both high explosive and armor-piercing ammunition.

The latest addition to air force ammunition is the 4.5-inch rocket. These rockets are being used to augment the already tremendous firepower of our fighter aircraft and have proved very valuable in attacks on enemy ground installations. The 4.5-inch rocket has about the same explosive effect as a 105-mm shell. It adds very little to the weight load of an aircraft and decreases its speed only a few miles per hour. The launchers are suspended beneath the wings of the aircraft and can be released in flight if circumstances demand such action.

This wide assortment of air force ammunition, designed for maximum destructive effect of specific types of targets, while making our aircraft a very excellent weapon, considerably complicates the supply man's problem.

The more "popular designs"—general purpose, fragmentation, and incendiary bombs —are required in tremendous tonnages. Then, too, the daily requirements may vary widely for even the same squadron. The supply is affected by the weather and the intensity of operations, as well as the type of objective. For instance, a fighter group normally employed in bomber escort requires normal quantities of machine-gun or cannon ammunition. If its employment is changed to intensive operations in close support of ground troops, the ammunition supply becomes an entirely different problem. Here they will require large quantities of bombs and possibly rockets in addition to machine-gun and cannon ammunition, and in all probability they will be able to make several attacks per day due to the much shorter distances flown. The supply of heavy bombardment aircraft is even more perplexing because of the tremendous quantities involved. When performing strategic missions deep into enemy territory where targets are defended with both antiaircraft fire and fighter aircraft, we find that a number of days are required between each flight for rest of the combat personnel and the repair of battle damaged aircraft. For this type of combat we consider that a normal amount of ammunition is required. On the other hand if we divert these heavy bombers to missions assisting the advance of our ground troops, as has been done in France, the problem of ammunition supply is considerably increased. The distances flown are shorter, a high degree of air superiority has been attained, and ack-ack fire is much less intense, allowing a much greater number of sorties to be flown. At the same time a much larger percentage of the bombs used will be of the fragmentation types, requiring the stockage of these items at our air bases in addition to the much greater amounts of high explosive and incendiary types employed in both strategic and tactical operations.

Air force ammunition supply to our theaters of operations, like all other supply, is based on established stock levels. These levels of supply are planned considering the time of resupply as well as the types of targets, the intensity of operations, and the numbers of aircraft to be employed. Any major changes in tactical plans requiring new types of ammunition or quantities in excess of previous requirements must, therefore, be planned well in advance if adequate ammunition is to be made available.

The stock level in the theater of operations is distributed between Air Force Ammunition Depots and Airdrome Ammunition Supply Points; and in some theaters Service Groups also operate Reserve Ammunition Supply Points. The distribution of this ammunition among these supply installations takes into consideration the same factors that affect plans for theater supply but in considerable detail. The type of aircraft based at an airfield, their design and ammu-

nition capacities, as well as probable employment, must be considered. The intensity of combat must be known far enough in advance to make the ammunition available to the airdromes, and it must be of the type for maximum effectiveness. The enemy capabilities of destroying our ammunition supply installations and even their capabilities of capturing an airdrome near the front lines will affect our base stockage.

The resupply in a theater of operations may be by ship, rail, truck, or even by air. The time involved in this shipment determines to a large extent the quantities needed in the theater to support any operation. In addition to the means of transportation and the distances involved, this time of resupply is affected by the amount of labor required to handle this volume of supply. The normal movement of ammunition from a ship at the port of debarkation to the Air Force Ammunition Depot, thence to the airdrome ammunition supply point and to the bomb bays of our aircraft, requires from ten to fifteen handlings. On the basis of a man being capable of handling a half ton per hour, the movement of the bombs for a thousand-ton raid will require from 2,000 to 3,000 man days of ten hours each.

The labor problem is accentuated in leapfrogging operations such as those in our Pacific Theater as well as in the movements of our tactical air force units in supporting a fast-moving ground situation.

The ammunition supply for the air forces is supply in volume but at the same time encompasses solving the problems of wide variations in types as well as in daily requirements. Ammunition for the air forces must not only be in sufficient volume but of the types providing maximum destruction for the targets attacked.

The RAF 2d TAF Mediums

From a British source.

THE RAF Second Tactical Air Force pinpoint specialists, the Mitchell and Boston medium bombers, are now operating from bases in Western Europe.

This is a development of far-reaching importance to the constantly changing tactical plan. The chief effect is that operations may now take minutes instead of hours. As targets are now so much nearer, an attack closely supporting the army may be carried out before the situation in the target area has had time to change.

The medium bombers carry navigators trained in the science of directing bombs to small but vital objectives from heights exceeding 10,000 feet, and since D-day many of these aiming points have been delicately near our troops. Concentrations of armor and strongly defended positions checking the advance have been smashed to open the way for ground forces.

The interval between an army commander's request for such an attack and its completion will be so reduced by this new development that where only one attack may have been possible from British bases, two may now be made from the advanced bases behind the battle line.

Next to time-saving come the advantages of conserving fuel, reducing the wear and tear of aircraft, and lessening the strain on the crews, who are likely to benefit by the knowledge that a damaged machine need not be flown back over the sea but landed on friendly ground a few minutes after the bombs are gone.

Direct aid to the army is the latest phase of medium bombers' activities. Before and since D-day they hammered communications and fuel installations, and there is abundant evidence of their success in air photographs and the examination of captured ground. Only the worst weather interrupts the bombing effort.

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"The Best Laid Plans--"

LIEUTENANT COLONEL CLARK G. JOHNSON, *Quartermaster Corps*
Instructor, Command and General Staff School

The following article is, in effect, a transcription of the author's story of certain of his experiences while serving as the Quartermaster of an overseas division, as narrated to Lieutenant Colonel S. B. Wuertenberger, a fellow faculty member at the Command and General Staff School.—THE EDITOR.

THERE have been a number of articles written in the various service journals and any amount of free advice has been handed out on the subject of prior planning. Most of this is for the embryonic staff officer about to depart for a theater. This advice has usually been fairly general in nature and based on references to Field Service Regulations. We went through all of this before our division sailed to take part in the North African invasion. Throughout that campaign and later on during the action from Salerno to Cassino in Italy, it was a sort of an after-supper game to note which things went according to the book and which did not.

We had been all through Tunisia and a few weeks in Italy before we were able to appreciate what is meant by that paragraph that promises: "Each chief of an army supply service provides the . . . technically trained personnel. . . . . Additional labor required is furnished by detail from the army. . . . . Army service personnel not only stocks the several supply points but also loads trucks dispatched for refilling from divisions. . . ."[1] During the first few weeks in the African campaign the division was operating semi-independently on supplies from a British army. We were part of one of the first mixed commands which fought throughout the Tunisian and Italian campaigns. The idea behind these mixed organizations was that, tactically, they should operate as a unit and that the service forces of each nation should supply their own units. During this period there simply wasn't any American channel of supply. We had to go back to the army depots with our own trucks and handle our own supplies. We drew gas in 55-gallon drums and had to do the necessary pumping for ourselves. That one detail—that is, to keep a 25,000-gallon level in 5-gallon cans in our division dump—kept twenty men busy for eighteen hours out of every twenty-four. We ran our own division dumps for Class I as well. These were apt at times to become large establishments. During one phase of the operations we were warned that we would have to furnish two provisional truck companies from our own division for the use of another organization and that we could expect these trucks to be gone for not less than two weeks. To cover us during these two weeks, we built up our division dumps to a level of seven days' rations and 80,000 gallons of gasoline. You can imagine the resulting problems in labor, dispersal, and camouflage for one QM company. After army had taken over in the Italian campaign we began to enjoy the fruits promised by that quotation. Even then we kept a division reserve of one "K" ration and 25,000 gallons of gasoline. The ration proved useful in a number of ways, such as feeding replacements (which were sent forward to their units through the QM), furnishing an extra day's ration for units on special missions, and for feeding visitors. All units in the division were drawing Class III supplies from the division QM; so that amount had to be maintained. Army took care of us, however. At Venafro, for example, when our QM bivouac was only four miles from the front, army put in a Class I supply point only a half mile to the rear and practically gave us cafeteria service. When the unit S-4's came in to collect rations they gave the QM Section a strength report for the following day. We incorporated this into the daily telegram, took it back to the army supply point, and drew the rations on the spot. There was no time lag whatsoever. When the official AG strength reports for that day came out, which was three or four days

[1] Par 170, FM 100-10, Field Service Regulations, Administration.

later, we checked back and made up with the unit any discrepancies there might have been with the tentative strength report the S-4 had turned in for that day. Not only did we have no time lag but we could also draw any proportion of any type of ration we wished. Troops in the line had to put up with "C" or "K" rations, but the moment they came out of the line we made every effort to get them over to the "B" rations immediately. To this end we would take changes in the ration requests from the units up to 0300 of the day they were to be drawn.

Remember how many times we heard, read, and practiced in our maneuvers: "The impetus of supply is from rear to front"?[2] We did have our plans set to handle the supply of the division after army brought it up to us. We landed at Oran and went over to Tlemcem for two weeks to get together with the rest of the division which had come in earlier at Algiers. We were then ordered up to the front as part of the British Army. For a period of forty-three days, during which time we were using the British compo rations, Class I supplies were held for us at Ebba-Ksour. Thus, for our Class I supplies, we had to send our vehicles a distance which went as high as fifty-four miles. Incidentally, this ration was all right, but our troops did miss their coffee. We scoured the country trying to take advantage of the exploitation of local resources angle but were unable to find a coffee bean. During this same period we were using British gasoline, which was available to us at the army supply point at Le Sers. This distance grew to sixty-nine miles. As a result a complete revamping of our transportation plan had to be effected before we were operating smoothly. The chief factor in our new plan was the reservation of twenty to twenty-five vehicles daily for hauling Class I and III supplies only.

One quotation from Field Service Regulations that almost became a subject for nightmares is: "Ordinarily, unserviceable matériel is replaced by serviceable matériel."[3] In the three and a half months of combat our division went through in Tunisia, this remained nothing but a quotation. We sensed that everyone along the line was trying; but what with the fluidity of the combat, the complexities of the inter-Allied command and mixed organizations, the lack of good lines of communication, and the long distances involved, we considered ourselves fortunate if any of the items in our requisitions were filled. In Class II clothing and equipment alone we received only some twenty-three percent of what we requisitioned. We estimated that Class II items were becoming unserviceable at a rate of two to five tons weekly. When the division came back to Oran after the campaign they were literally in tatters. Since Oran was a base port, the division was able to re-equip completely. It was a good lesson for us, though, and the division was really able to appreciate the manner in which army functioned after its arrival in Italy.

During the time we were in Italy we played one principle of supply for all it was worth. You know the FSR tells you that "supplies are obtained in the theater . . . by exploitation of local resources. . ."[4] We had already found out during the initial phase in Africa, in our search for coffee, that this exploitation of natural resources had to remain strictly theoretical unless we wanted sand, mud, or cactus thorns. It did not take long to get a full appreciation of exploitation after the Italian campaign opened. Within a short period of time the division found itself operating with a total of 1,200 mules. After a series of conferences with army we did get some harnesses, shoes, hay, and other miscellaneous equipment, although not enough. As a matter of fact, we succeeded in getting all this on or into the mules in a somewhat ingenious fashion, except for the shoes. It seems that one must have horseshoe nails to put on the shoes, and there were no horseshoe nails. We went to work on the exploitation of natural resources and found that among the few resources the Italians had left and the Germans hadn't taken with them

[2] Par 40, FM 100-10, Field Service Regulations, Administration.

[3] Par 42, FM 100-10, Field Service Regulations, Administration.

[4] Par 65, FM 100-10, Field Service Regulations, Administration.

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were three local blacksmiths. We hired them and put them to work hammering out horseshoe nails from ordinary carpenter's nails, and it proved to be a full-time job for these three. We also had to run in a little exploitation for hay before we were through. Incidentally, we always had a fund on hand for just such exigencies. During the North African campaign the division had $100,000. It was a case of having the money but nothing to buy with it. We finally were able to replenish our stationery and printing supplies by local purchasing in Tunis. This amounted to a little over $1,000. For the Italian campaign we were given $25,000 and again most of what we spent went for stationery and printing supplies, along with the hay and horseshoe nails mentioned before.

One of our biggest jobs is set forth in one of the shortest paragraphs in the FSR: "In divisions and higher units salvage operations are supervised by a salvage officer who functions under the unit quartermaster."[5] At the start of the Tunisian campaign the one thing which was a surprise to everyone in the chain of supply was the quantity of salvage involved and the wear and tear on equipment in combat. The detail necessary for salvage operations had to be gradually built up until it reached a satisfactory level of 100 men and two officers. These men would follow up the combat troops as they moved forward, salvaging the vacated areas as soon as possible. From time to time we would actually go out and police the area our division was moving into and another moving out of. On one such occasion, in one morning we picked up twenty-three .50-caliber machine guns and two mountain howitzers, all in serviceable condition. This was in addition to the usual items of salvage. Let me emphasize that practically all of the matériel we processed as salvage was genuine salvage. It is true that the first week or so there was some "throwing away" by the troops, but strict directives and close supervision stopped this and we were never bothered with it thereafter. Normally the units brought the salvage items to the QM bivouac where we sorted it for serviceable items that could be reissued, but the remainder we segregated as to the using arm or service, and what we could not dispose of within the division in this manner we took back to army. You never get quite all of the damaged items that are salvaged; so the tonnage of items which we processed never equalled the amount we had to issue for replacements.

You may recall that FSR tells us: "Mortuary matters in the theater of operations are conducted and supervised by the Graves Registration Service. . . . . When necessary, units of the Graves Registration Service are reinforced by labor troops or by civilian or prisoner labor."[6] In general, we could not get civilian or prisoner labor for the digging of graves and the handling of burials; so we had to devise another system. It necessitated having twenty men detailed from replacements as graves diggers. As replacements were processed through the QM bivouac, we were able to retain this number at all times. In our division there were very few instances where isolated burials had to be made; and such as there were, were disinterred and given regular burial in the division cemetery as soon as possible. As unpleasant a duty as it may be, the burial process can be of value to the Division Quartermaster. He should supervise it anyway, and by so doing can get a fairly accurate index of the condition of the equipment and clothing in the unit to which the casualty belonged. While we were in the Venafro-Cassino area, corps set up a somewhat unusual but very practical system for the handling of burials. Corps established a corps cemetery, taking away each division's attached graves registration platoon with the exception of five men. These five men set up a division collecting point well forward. The units then brought their dead to the division collecting point where initial phases of the registration were effected and the body placed in a trailer. The trailer was towed back to the corps cemetery where registra-

[5] Par 530, FM 100-10, Field Service Regulations, Administration.

[6] Pars 522, 524, FM 100-10, Field Service Regulations, Administration.

tion and burial were completed. Bodies without complete or proper identification were held at the division collecting point while every effort was made through other members of the respective units to complete the identification. In general, the enemy dead were handled in a similar manner.

One last incident that comes to mind demonstrates very effectively the interdependence of our supplies and our transportation. This was an immediate sequel to the Kasserine episode. Our company had bivouacked at Kef el Ahmar Pass and put our division Class I and III supply points six miles forward of the pass with the service platoon. Division headquarters notified me about 2100 one evening that we would withdraw that night, giving us priority on the main supply road until daylight. It did not occur to me that there was any immediate urgency about the withdrawal, though I ordered thirty trucks up to the dumps and went up myself about 2130. About 2200, I noticed the roads were fairly well jammed with vehicles, the excess coming from an adjacent French unit which had been forced by enemy action into our area. About 0200, one of our own combat teams went past. Up till then only twenty-one trucks had arrived, which we were loading and squeezing on to the road piecemeal. By 0430 the last of the twenty-one trucks had cleared, and to our remaining dump of about 9,000 rations and part of the service platoon went the dubious honor of holding the front line! As dawn was breaking in the east, we lit a pyre to our mistake, touched off our rations with some spare gasoline and pulled out. We found out later the nine trucks had been held up by traffic congestion in the pass. We lost no personnel, but we did learn a lesson and never separated our transportation and supplies after that.

I've done a lot of talking but I know you will expect me to add to all that free advice that is available. That can be done very briefly: *Keep your plans flexible.*

Russian Attack Planes

From an article by S. Ilyushin, a leading Soviet aircraft designer and creator of the IL-2 plane, known as the Stormovik, in *Information Bulletin*, Washington Embassy of the USSR.

SOVIET designers directed their efforts toward constructing aircraft which would prove most effective in aiding operations of the ground forces of the Red Army.

I visualized the conditions under which a machine would operate and the targets it would have to destroy—infantry, tanks, motor trucks, guns of various calibers, machine-gun nests, fortifications, etc. This required that the plane be equipped with various armament: machine guns, cannon (of various calibers), bombs, and rocket shells. To spot and strike effectively such small land targets as men, tanks, motor trucks, single guns, and machine-gun crews, which very often are camouflaged, the plane must be able to fly at altitudes of from ten to 500 meters. From greater heights these small targets would be difficult to locate and hit.

But in flying low over enemy territory a machine is bound to encounter heavy fire. This led to the idea of protecting the plane with armor—making it invulnerable to rifle and machine-gun fire and partly to fire from guns of small caliber. Thus the attack plane IL-2 came into being.

In designing the IL-2, I took every precaution to make it easy for mass production and mass exploitation under battle conditions. The difficulty lay not only in the organization of mass production, but also in the manufacture of the complicated armor covering the body.

The foe will soon feel the blows of our new Stormoviks, highly improved models.

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Battle Drill for Conditioning

MAJOR JAMES S. METCALFE, *Field Artillery*

WITH THE FIFTH ARMY, ITALY.—The peacetime propensity of Americans for automobiles once caused some concern among professional worriers who even envisaged atrophy of the army's leg muscles through continuous recourse to motor transport.

The performance of Fifth Army infantrymen who marched and fought across Italian plains and mountains from north of Naples to the Arno River should convince the world that today's American foot soldier can arrive at the right place at the right time, in fit condition to win the battle.

The stamina demanded by this lightning offensive was not acquired solely by long marches under full pack during the preparatory training phase. To be sure, such a program might have brought about the desired hardening of personnel, but it would not have accomplished much else.

Obviously, the best equipped soldier is not necessarily the best fighting man. If his equipment is to pay dividends, he must be in condition to use it; and he must surpass the enemy in combat knowledge to use it most effectively.

A young colonel in the Fifth Army whose aggressive regiment has distinguished itself in the Italian campaign was asked how he prepared his command for the offensive which started on 11 May. He replied, "By battle drill."

This is a form of training which combines extended order drill and small unit tactics to complete the trinity of equipment, condition, and knowledge. Endurance is developed concurrently with the learning of tactics, technique of arms, terrain appreciation, and leadership.

Battle drill, as used by the —st Regiment, is continuous. It is employed during rest periods, or lulls in a campaign, to instruct and condition replacements and to further exploit the knowledge gained by the veterans in combat.

The squad is habitually the basic unit in these exercises. In combat, nearly every action ultimately breaks down to squad-size or smaller. All members of the regiment participate in battle drill, regardless of their assigned duties. Battalion officers are formed into rifle squads and function as such under the leadership of battalion commanders. Officers thus learn exactly what to do, and what to look for, when they later instruct their units.

Even the heavy weapons companies turn out as provisional rifle squads, come to close grips with the foot soldiers' problems, and arrive at a fuller appreciation of the support rendered by their own weapons.

The rifle squad is divided into its two customary elements for battle drill: the BAR team and the rifle team. The squad leader, BAR man, assistant BAR man, ammunition carrier, and two scouts make up the BAR team. The rifle team consists of the assistant squad leader and five riflemen.

The squad leader is told the conditions of the exercise, mission, objective, and such other pertinent information as would be available in combat. This orientation is given by an officer, and upon its completion, the squad leader takes over.

His order to the squad is usually a condensed five-paragraph field order, issued verbally. What is more, it is given forcefully, clearly, correctly—or repeated until it is. The scouts, constituting the maneuver element of the BAR team, move forward to establish routes to, and select the place for, the base of fire. Meanwhile, the rifle team, principal maneuver element of the squad, sets out for the objective, employing route, formations, and methods best suited to the situation.

Although the hazards of combat are lacking in battle drill, many of its factors, such as hard work, rapidity of action, and fatigue are present. Noncommissioned officers develop increased confidence in their own ability to lead men, and that confidence is reflected by the prompt compliance their orders receive.

Officers supervise the activities, and they demand proper execution of every phase. The fire and movement by individuals never degenerates into a game of "Cowboys and Indians." Men who have been in battle, or who are shortly to enter combat, show a gratifying willingness to learn as much about it as they can.

The momentum continues throughout the period. When a squad has finally captured its objective, say a small terrain feature, the problem goes right into the reorganization phase in anticipation of an enemy counterattack. Immediately following the reorganization, the next mission is assigned.

Battle drill is performed at the double. Running or climbing over Italy's rugged terrain gets a man in condition and keeps him that way.

The —st Regiment received its first battle experience during a static situation along the Garigliano River. Here, its action was confined to aggressive patrolling. Prior to the opening of Fifth Army's great offensive on 11 May, the —st was relieved and placed in a rest area for final equipping and training preparatory to the forthcoming operation.

Its members had seen enough combat to appreciate this last opportunity to get squared away. Consequently, there was no trifling, and men trained with grim seriousness. Battle drill presupposes that basic training has been completed. Such, of course, was the case of this regiment.

The regimental commander, with a firm base to build on, included a number of river crossings and night attack problems in readying the men for the offensive. Too much emphasis on any type of training can reach a point of diminishing returns, and battle drill can be overdone. This was avoided.

Long hikes with full pack have a place in training, but some S-3's regard them as the only means of complying with a directive which states, "Physical conditioning will be stressed."

At the end of an arduous march, a soldier can contemplate his weary feet with scant satisfaction. At the end of a battle drill, he can feel that, despite his weariness, he has learned a bit more about the most important subject in the world to him—combat.

Anybody who saw infantry soldiers of General Clark's Fifth Army fighting in the mountains of Southern Italy, then pursuing a rapidly retreating enemy across those roadless masses of high ground, fighting and taking up the pursuit again and again, wouldn't have doubted their high degree of physical fitness.

As for the combat knowledge and initiative of the squad leaders and other noncommissioned officers, here are some extracts from the —st's recent history:

"Under the direction of Sergeant ——, a firing line was built up at the base of the hill, and heavy fire was poured into the enemy positions. Three prisoners came down under a white flag. Sergeant ——, leading eight men, encircled a machine-gun nest, taking two more prisoners. About twelve Germans were killed and eleven prisoners taken before the resistance was broken and hill —— occupied.

". . . On reaching the base of Mt. ——, he sent Technical Sergeant —— with a squad to the far side of the hill to move in on the enemy while he attacked with two squads up the forward slope. The platoon was met, but not stopped, by heavy enemy machine-gun and mortar fire as it advanced up the hill. The enemy, not knowing which way to turn as the attack hit from two directions, was trapped and cut to pieces. Private ——, a scout, crawling through the hail of fire, killed two Germans manning a machine gun, charged into the heavy woods on the rear slope, killing three more with a grenade.

"Sergeant —— with three men, advanced up the hill, knocked out a machine gun and forced a mortar to withdraw.

"In the entire fight, thirteen Germans were killed, and eighteen were captured, including one officer. While returning to rejoin the battalion, Lieutenant —— and one man were wounded by shrapnel. These were the only casualties.

". . . After three enemy machine guns

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had been knocked out by Sergeant ——'s men, and several Germans killed, the enemy didn't appear so anxious to show himself."

The —st Regiment's history is replete with many incidents similar to those quoted here; the most of them deal with action by squads or platoons.

Battle drill not only trains squad leaders but also develops potential leaders. The turnover of NCO's in combat is often discouragingly high. When replacements are needed, they are needed in a hurry; and frequently, the squads will have to provide them.

A personnel center now providing filler replacements to General Clark's Fifth Army has recently incorporated battle drill as part of its training program. Men going to rifle companies from this depot are able to take their places in the squads with a minimum of readjustment, conditioning, and technical training required after joining the organization.

Fundamentals for the Officer

From *Canadian Army Training Memorandum*, No. 28.

Do you want to know what one high commander in a theater of war thinks the most vital things for his junior officers to know?

Here they are:

a. Speedy decision and aggressive action. Automatic decision and action without waiting to be told, without wasting time waiting for orders from the next higher commander.

b. Maneuver—how to put on a quick flanking attack when it is needed—how not to throw troops away by pounding straight ahead against well organized resistance.

c. Map reading—especially foreign maps that may be the only ones available in that particular theater of operations.

d. Handling your command at night—the approach march—marching to the assembly and forming-up positions—night attacks—keeping direction—accurate use of the compass—the silent approach and the bayonet attack.

e. Reorganization—replenishment of ammunition, food, and water, when you have captured your objective.

Are any of these new? Are any of these special? Are not they the common sense of battle—the things in the book—the things every small unit commander with any common sense and imagination knows are going to be vital later on?

Are there any of these things that any commander of any rank does not recognize as of utmost importance in training?

If I had to go to the States and train a new battalion, I would give the following matters priority as indicated:

1. **Discipline.**
2. **Responsibility of NCO's and junior officers.**
3. **Gunnery, formal and field, crew drill.**
4. **Tactics, platoon and company.**
5. **Communications.**

—A Commander in an armored division

"I Can Support the Operation"

MAJOR JOHN M. CHRISTENSEN, JR., *Quartermaster Corps*
Instructor, Command and General Staff School

A STATEMENT such as the title indicates must be obtained from the G-4 before any major operation can be undertaken by the commander with any hope of success. The logistical support to be furnished an operation will determine to a large degree how extensive and how elaborate the tactical plan may be. If necessary, the tactical plan may have to be revised until the G-4 can say with assurance that he can support the operation from a supply, evacuation, and maintenance standpoint.

But what is behind this statement of the G-4? What planning must he do and what must he foresee in order to make these few words an actuality? To this end it is hoped the next few pages will save some supply officer untold grief as a result of omitting a vital element from his logistical plan, and will help him in formulating his plan with the knowledge that it is well done.

In order to draw up a plan of supply and evacuation the G-4 must do three things. He must first collect all the information and data he can about the items to be considered; secondly, he must evaluate the information as it pertains to any particular item so that he may determine which item or which means will best serve the unit; and thirdly, he must arrive at a conclusion as to what he will recommend as a result of the evaluation he has just performed. These three steps are nothing more than an orderly process of thinking and may be found in the same sequence in FM 101-5 under "Estimate of the Supply and Evacuation Situation."

There is no easy way of planning, but there is a method which will materially assist called the "Check List method of planning." The reason for bringing in collection of information, evaluation of information, and the conclusion to be drawn is that the process must be adhered to in the Check List method of planning. In this method each item is considered by itself, the information and data available are evaluated, and a conclusion is immediately drawn as to how the item will be handled in backing up the tactical plan. By considering each item individually it is possible to take advantage of the tendency of the three steps, collection, evaluation, and conclusion, to merge into one thought. The immediate advantage of considering each item separately, then, is obvious since the time saved in reaching a conclusion on the item may have a material bearing on the over-all tactical plan. Another advantage, of course, is that the important and changing items in the supply and evacuation plan can be considered before the minor and static elements of the plan are considered. In applying the logical thought process of collection, evaluation, and conclusion to each item that will have a bearing on the supply and evacuation plan, the G-4 can quickly arrive at the recommendations which will be included in his plan.

The Check List is a tool that should be employed when planning item-by-item to assure that no element of the plan is omitted. Any G-4 can draw up a Check List to fit his needs, and by utilizing this list when drawing up his plan he can be certain that he has considered every element that has a bearing on the support necessary for the tactical plan. Included at the end of this article is a sample Check List of the type referred to above. It is only a suggestion as to how the list might look and as to what it might contain. The list could be used "as is" or modified to fit a particular unit or situation. There is one feature about this particular list, however, that bears closer inspection. The list is drawn up to follow in general the form for the Administrative Order. By using this form the items of the plan can all be found under the proper paragraph headings when the time comes to transpose the plan into the Administrative Order. Further, by having such a sequence, any particular item in the plan can be quickly located and considered. As stated before, this Check List is merely a guide and is not

guaranteed to be all-inclusive for all units or situations. However, it does convey the impression of how a Check List might appear, and would probably be sufficient in the average situation.

So there is the "Check List method of planning" for the G-4. First of all he draws up a Check List that he can apply to most situations in which his unit will be involved. Then when he is called upon for a Supply and Evacuation Plan to support a tactical plan he considers each item that will have a bearing on the plan. In considering each item, he must collect the information and data pertaining to the item, evaluate that information to determine how it will help or hinder his plan, and then arrive at his conclusion as to how the item should be handled. And finally, when the G-4 has arrived at all the conclusions for all the factors he must consider, he will have formulated his logistical plan to support the operations.

Reduced to fundamentals, this planning can be summed up as using logical thinking processes applied to individual items to develop the whole plan, assisted by a Check List guide which includes the items to be considered.

This, then, is the manner in which G-4 can plan. The result of the planning he does is the Supply and Evacuation Plan to support the tactical plan of the commander. When the G-4's plan is completed he can see whether he has the means to support the operation as contemplated, or not. As every officer's ambition should be to be able to support his commanding officer, the G-4 will say of the logistical plan, if it is humanly possible, "I can support the tactical plan."

SUPPLY AND EVACUATION PLAN

G-4 CHECK LIST

Unit
Place
Time and date

Maps: (Those needed for an understanding of the plan; identify and give scale.)

1. SUPPLIES. — (Separate consideration to classes, types, or supply branches, as necessary):
   - *a. Requirements.*—Probable expenditures; stocks on hand; local resources; reserves desired.
   - *b. Procurement.*—Stocks to be requisitioned or credits to be requested; time, rate, method, and place of delivery.
   - *c. Installations.*—Time and place of opening or closing; service troops required to operate, including labor, transportation, and reserve; troops to be served by each; limitations on stocks; mobility.
   - *d. Distribution.* — Time and method of issue; limitations on subordinate unit stocks; destruction and abandonment of supplies.

2. EVACUATION:
   - *a. Casualties.*—(Separate consideration to personnel and animals.)
     - (1) *Casualty Rate.*—Present rate; anticipated increases or decreases in rate.
     - (2) *Installations.*—Time and place of opening or closing; troops required for operation, including reserves; troops to be served by each; mobility.
     - (3) *Operation.* — Evacuation policy; channels of evacuation; methods of support of lower units; abandonment of wounded.
   - *b. Matériel.*—(Separate consideration to classes, types, or supply branches, as necessary.)
     - (1) *Recovery, Evacuation, and Maintenance:*
       - (a) *Maintenance Rate.*—Present rate; anticipated increases or decreases in rate.
       - (b) *Installations.*—Time and place of opening or closing; troops required to operate,

including labor, transportation, and reserves; troops to be served by each; mobility.

(c) *Operation.*—Evacuation policy; channels of evacuation; method of support of lower units; destruction and abandonment of damaged matériel.

(2) *Salvage.*—(Same as for Recovery, Evacuation, and Maintenance.)

(3) *Captured Matériel.*—(Same as for Salvage.)

IN ADDITION TO ABOVE, CERTAIN EVACUATION ITEMS ARE CONTROLLED BY G-1; FOR INSTANCE: PRISONERS OF WAR, BURIAL, CIVILIANS.

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3. TRAFFIC:

a. Circulation, Restrictions, Control:

(1) *Plan:*

(a) Points and units to be served; roads available, their condition and capacity; provision for reconnaissance; coordination with other units.

(b) Designation of main supply road(s); secondary circulation.

(c) Traffic priorities; traffic restrictions, as lights, speeds, distances.

(2) *Control:*

(a) Requirements of traffic plan; special requirements due to traffic priorities or tactical movements.

(b) *Installations.*—Time and place of opening or closing; troops required to operate, including reserves; transportation headquarters.

(c) *Operation.*—Means of enforcement; marking of routes.

b. Construction and Maintenance:

(1) *Roads:*

(a) Requirements in materials, maintenance troops, and equipment.

(b) Priority of work, standards of maintenance, coordination with other units.

(2) *Railroads.*—(Same as for Roads.)

4. SERVICE TROOPS AND TRAINS:

a. Trains.—(Separate consideration to motor, rail, water, and air transport, as necessary.)

(1) *Requirements.* — For control of trains of lower units; for troop movements, for attachment to service installations; for retention in pool, including reserves. Attachments.

(2) *Installations.*—Assignment of general restrictions or specific areas; motor pools; time and place of opening or closing; troops required, including reserves.

(3) *Operations.*— Responsibility for control, methods of request, assignment and use, assumption and relinquishment of control of transport of lower units.

b. Service Troops:

(1) Recapitulation of requirements of service troops, both operating and in reserve; future requirements.

(2) *Installations.*—Location, time, and place of opening or closing of bivouacs, administrative control headquarters.

(3) *Operations.* — General operational and administrative instructions not otherwise covered; alert plans for and assignment of missions to inactive or reserve service units.

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5. PERSONNEL (CONTROLLED BY G-1).

XUM

6. MISCELLANEOUS:

a. Rear Boundary.—Recommendation for location.

b. Rear Echelon of Headquarters.—Location; time and date of opening if not already open.

c. Security and Protection.—Instructions for protective measures, information as to missions, locations, time of arrival or leaving of tactical units having security or protective missions.

d. Administrative Matters Not Otherwise Covered.

AC of S, G-4

Patients Evacuated to Zone of the Interior

From an article in *The Bulletin of the U. S. Army Medical Department*, September 1944.

THE Office of The Surgeon General receives reports from port surgeons at ports of debarkation as to the number of evacuees arriving in the United States, and details of individual cases are obtained later from the Sick and Wounded reports.

A review of individual Sick and Wounded reports for more than 36,000 evacuees shows that the primary cause of evacuation in over eighty percent of the cases was disease. Battle casualties and injuries other than battle casualties each accounted for less than ten percent of all evacuees. The airplane was used as the means of transportation in only about one out of every eleven cases arriving in the United States. Relatively few battle casualties reached this country by plane.

Differences in evacuation policies and in health conditions in the theaters obviously result in differences in the number of men evacuated per 1,000 strength. Thus, because of its evacuation policy and relatively high morbidity from disease, the South Pacific has evacuated men at a considerably higher rate than other theaters. Because of the very favorable health conditions in the Central Pacific, the rate of evacuation has been very low. Until the invasion of Normandy, the North African Theater, which includes Sicily and Italy, was the only theater where sizable combat operations had been practically continuous for a considerable period. For that reason the number of men evacuated per 1,000 strength on account of battle casualty was substantially greater than for other theaters. The North African Theater also showed a much higher rate of evacuation than other theaters for nonbattle injuries.

If allowance is made for the effects of evacuation policy, significant differences between theaters in the rate of evacuation for individual causes become apparent. Thus, it becomes clear that the rate of evacuation for psychoneurosis has been highest from theaters (such as the North African, South Pacific, and Southwest Pacific Theaters) in which combat action has taken place. However, with increasing knowledge of this problem the number of cases of psychoneurosis has decreased in recent months. Differences between the theaters in regard to patients evacuated for psychosis have not been very large.

Whoever reads history with a mind free from prejudice cannot fail to arrive at a conviction that of all military virtues, energy in the conduct of operations has always contributed the most to the glory and success of arms.

—Clausewitz

Preventive Tire Maintenance—It Can Be Done!

Prepared for the MILITARY REVIEW under the direction of the Director, Maintenance Division, Army Service Forces.

THE dramatic episodes of war—the stories of bravery and sacrifice—are the ones that become history's landmarks. But it must never be forgotten that every-day jobs being done by the men behind the scenes, the stagehands of the theaters of war, are part of history, too. The records of routine duties, performed faithfully behind the backdrop of war's grim scenes, are worthy of more than passing note.

One of these records is the story of the preventive tire maintenance program being carried out by the Antiaircraft Artillery Training Center at Fort Bliss, Texas. This program operates under the plan outlined in War Department Memorandum No. W 850-44, 24 April 1944, except that military personnel are used instead of civilian personnel. The principle behind the program is found in the first paragraph of the memorandum, emphasizing the seriousness of the tire shortage and stating what the program is expected to accomplish, as follows:

> "Recent surveys indicate that the useful life of tires can generally be extended by as much as 50 percent by proper preventive tire maintenance. The critical nature of the present tire shortage demands immediate initiation of a vigorously enforced preventive maintenance program to reduce to a minimum the drain on the army supply of new tires. The program will be *directed toward a systematic detection and correction of incipient tire failures before they occur or develop into major defects.*"

The results of the AAATC program to date have been extremely gratifying, and they point the way for all to follow in conservation of the present stocks of new tires and tubes through application of fundamental preventive maintenance practices. For in only two months' time, the program produced tangible results.

Tire deficiencies have been reduced from an average of .45 percent to .12 percent. Out of a total of 40,000 tires in operation, only 16 tires were turned in to the tire collection center during the month of June because of damage aside from that caused by fair wear and tear. And of these 16 tires, 12 were damaged in the maneuver area! This represents an infinitesimal 1/25 of one percent!

Briefly, the plan used by the AAATC is carried out as follows:

At present, one commissioned officer from the AAATC is made responsible for the effectiveness of the program. Later, it is planned to assign two non-commissioned officers delegated by the Commanding Officer, to act as assistants, thus forming a "tire inspection team" that will be able to canvass from five to eight thousand vehicles a month. Success of the plan depends, of course, on the cooperation of all personnel who have anything to do with operation and maintenance of rubber-tired equipment. And this cooperation is obtained far more easily because they are told *why* certain procedures must be followed. Many times a job may seem unnecessary when the reason for doing it is not known, and it is human nature to balk at doing unnecessary work. Therefore, the man who knows the *reason* for doing something will do a better job than the man who does it just because he has been ordered to.

The tire officer is trained under the civilian tire technician assigned to the tire collection center of the combined maintenance shop. His first duty is to make detailed inspections of all tires in every organization at the training center. He is a "tire doctor," diagnosing the causes of tire failures, making suggestions and giving instructions for correcting them, insuring that tires are turned in for repair as soon as injuries are noted, and informing commanding officers, motor transportation officers, and enlisted personnel of the critical rubber situation and of the need for rigid tire maintenance and rubber conservation practices. He instructs personnel on proper methods of forwarding unserviceable tires, tubes, and tracks for inspection and exchange.

REPORT OF INSPECTION OF TIRE CARE AND MAINTENANCE

Organization _____ Date Inspected _____

Inspected by _____ Correctives by _____

1—Air Pressure Facilities:

(a) Adequate _____ (b) Good Working Order _____

(c) Procedure for checking air pressure and inflating tires satisfactory _____

(d) Air Compressor _____

3—Air Gauges:

(a) Sufficient _____ (b) Accurate _____

3—Tire Maintenance:

(a) Inspected _____

(b) The following items require attention:

(1) Under inflation _____ (2) Over inflation _____

(3) Flat _____ (4) Valve caps _____

(5) Valve position _____ (6) Wheel alignment _____

(7) Retreading needed _____ (8) Repairing _____

(9) Matching _____ (10) Direction _____

(11) Material between Dual _____ (12) Oil on tires _____

(13) Uneven wear (Rotation) _____

4—Periodic inspections of wheels, rims, tires, and endless band tracks being held in the unit.

_____

5—Half Tracks:

(a) Number of tracks inspected _____

(b) The following items require attention:

(1) Too much tension _____ (2) Too little tension _____

(3) Bent or worn guides _____ (4) Modifications _____

(5) Idler and sprocket alignment _____ (6) Replacement _____

(7) Rotation _____

6—Remarks:

The effectiveness of his work is insured by action of the commanding officers, to whom he submits comprehensive reports. He gives further impetus to the program by enlisting the cooperation of the tire inspectors at the tire collection center, thus insuring maximum flow of serviceable replacements to the using organizations.

The inspecting officer, upon arrival at the motor pool, contacts the commanding officer and the motor officer of the organization and invites them to accompany him on his tour of inspection. TM 31-200 is used exclusively as the basis for inspection and correction of tire deficiencies, and as deficiencies are noted, they are explained and advice is given as to the corrective action required. Individual reports are made out in duplicate for each vehicle inspected. (The report form used is a briefed version of the form illustrated on pages 28, 29, and 30 of War Department Memorandum No. W 850-44, and is reproduced on page 76.) One copy is turned over to the motor officer with a deadline date for correction. The original copy is sent to the Commanding General, AAATC, who forwards it to the organization commander with remarks.

In addition to tires, tubes, and tracks, the inspection covers the condition, availability, and adequacy of tire and tube repair equipment, tools and materials, including supplies such as valve caps, valve insides, replacement valve stems, etc. The results are recorded on a cover sheet which lists the deficiencies and makes appropriate recommendations. This cover sheet accompanies the vehicle inspection sheets, which are routed through the

THE TIRE INSPECTOR'S JOB

TM 31-200 used exclusively as basis for inspection and correction of deficiencies.

1. Contacts commanding officer and motor officer of organization to be inspected and invites them to accompany him.
2. Makes detailed inspection of all tires in organization.
3. Diagnoses causes of tire failures. Makes suggestions and gives instructions for correcting them.
4. Explains deficiencies and gives advice on corrective action required.
5. Notes deficiencies on report form, made out in duplicate, for each vehicle. Original copy is forwarded to Commanding General, thence to Organization Commander. Duplicate copy to Motor Officer with deadline date for correction.
6. Instructs officers and enlisted men on need for rigid tire maintenance and conservation.
7. Checks to see that tires are turned in for repair at the right time. Issues instructions for forwarding unserviceable tires, tubes and rubber tracks to the supply point.
8. Secures cooperation of tire inspector at supply point to insure maximum flow of replacements to using organization.
9. Checks tire and tube repair equipment, tools and materials for condition, availability and adequacy. Lists results on cover sheet which accompanies vehicle inspection sheet.
10. Makes follow-up inspections.
11. Grades organization according to standard rating.

XUM

Commanding General to the Organization Commander. *Follow-up inspections are made periodically.* A standard rating is set up, and each organization is graded according to this standard. *The ratings are turned in to the Commanding General.* This grading system establishes a spirit of competition between units and thus provides an incentive to careful application of the preventive and corrective measures suggested.

Though the program, as outlined, contains all the important factors for successful action, there is one vital point that must be remembered. This is the fact that it is the interest and vigorous participation of staff officers in establishing and carrying out the necessary inspections which provides the "motive power."

Success depends on others, too, of course. Besides the support of the Commanding General and the action of staff officers, the close cooperation of the Post Tire Technician, combined with the inspection activities of the tire officer, and, last, but not least by any means, the wholehearted application of preventive maintenance by operating personnel, are necessary to make this program one of the many high-spots on the too-often obscured record of the "men behind the men behind the guns."

The RAF's Mark XIV Bombsight

From *The Times*, London.

FOR the last two years RAF Bomber Command has been using a bombsight of which details may now be given—the Mark XIV. In August 1942, the first ones were delivered to the new Pathfinder force. Before long the Mark XIV was in use throughout Bomber Command, and it was with this sight that all the great battles were fought—the battles of the Ruhr, Hamburg, and Berlin. It was also used for precision attacks on targets in France, when it was imperative that French lives should not be unnecessarily endangered.

The Mark XIV has two advantages over the earlier types. It gives the pilot comparative tactical freedom during the bombing run, and the number of settings and compensations which the bomb-aimer has to make is reduced to a minimum. As the air bomber takes his aim he looks through the sight and sees a sword-shaped cross moving over the ground. He knows that the point covered by the cross at the time he releases his bombs is the place where the bombs will fall. The pilot can take evasive action almost up to the moment the bombs are released, and the bomber can still aim accurately even when the pilot is making a banked turn or when gliding or climbing.

The Mark XIV consists of two main parts —the sighting head, which is in the nose of the aircraft, and a rectangular box called the computor, which might be described as the brains of the machine. The necessary calculations, taking into account the speed and direction of the wind, the air speed and ground speed, and the height of the aircraft above the ground, are worked out in this robot box. All the bomb-aimer has to do is to give the box the five facts. Three of these can be set in the machine before the aircraft takes off, and the only adjustments which have to be made in the target area are the allowances for the wind speed and wind direction. Once these two adjustments have been made, the bomb-aimer can concentrate his whole mind on identifying the target. This bombsight as used by the U. S. forces is known as the T.1.

In the officer who demands hardness in others, hardness is a prerequisite.

—From "Thoughts on the Training of German Soldiers," by a Captain in the German Army.

MILITARY NOTES AROUND THE WORLD

GREAT BRITAIN

Spitfire XIV:

The new Spitfire XIV is the fastest member of this distinguished family so far seen in service. It has been in action against the flying bombs, destroying more than 300, and over northwestern Europe, but opportunities for a trial of strength with the Luftwaffe have been negligible.

The Mark XIV, which reverts to the original elliptical wings but has a slightly larger rudder than the older models, is powered by a Rolls-Royce Griffon 65 engine developing more than 2,000 horsepower and driving a five-bladed Rotol constant speed propeller. The introduction of the Griffon engine and the five-bladed propeller give the machine an unequalled rate of climb and a high altitude performance calculated to keep it above any fighter the enemy can put into the air. It has been flown at 40,000 feet, and pilots speak enthusiastically of the ease with which it can be handled.

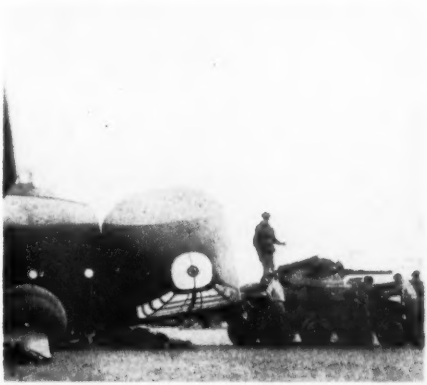
The five-bladed propeller has been developed because the four-bladed airscrew could not absorb sufficiently at altitude the power of the new engine. For the same reason the rate of climb and the cruising performance also suffered.

Armament of the Spitfire XIV may consist of four 20-mm or two 20-mm cannon and two .5-inch machine guns or two 20-mm cannon and four .303 machine guns. Either a 250-pound or a 500-pound bomb can be carried underneath the fuselage.

(*The Times*, London)

Tetrarch and Hamilcar:

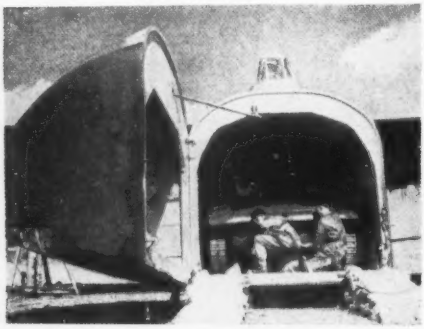
One of Britain's first-class tanks is the specially-designed airborne Tetrarch. In June 1940 the General Staff at the War Office, together with experts from the Ministry of Supply, foresaw that there would be a need for an airborne tank when we invaded the Continent, a tank which could be carried in a glider. So the Tetrarch was invented. It weighs less than ten tons and is very fast, with a cross-country performance of twenty-five miles per hour. It is capable of crossing a gap five feet wide and of climbing a slope of thirty-five degrees. It is armed with a special gun giving remarkable fire power. Together with the Locust, its American counterpart, the Tetrarch has proved itself worthy of its famous name.



HAMILCAR GLIDER RECEIVING A TETRARCH TANK.

The Hamilcar glider was "tailored" from

the beginning of its design to fit around the Tetrarch. In addition to carrying tanks and airborne troops, these huge gliders are capable of carrying vehicles of all kinds, 75-mm howitzers, 3-inch mortars, and assault reconnaissance boats and bridging material.



THE NOSE OF THE GLIDER SWINGS OUT TO RECEIVE THE TANK.

(*The Sphere*, Great Britain)

"Earthquake" Bomb:

The Air Ministry announced that the Royal Air Force has been breaking dams, seawalls, and submarine pens recently with a new type 12,000-pound "earthquake" bomb that it described as "undoubtedly the most destructive air weapon ever used."

The big weapon combines great penetrative power with a terrific blast effect. The old type 12,000-pound factorybuster detonated on the surface and destroyed its target by the blast alone, the Air Ministry observed. The blast of either one makes that of the German flying bomb look like a toy.

The new bomb is three times the size of the original blockbusters, one of which is known to have destroyed at least thirty buildings during an attack on Emden. That would mean that under the same conditions the "earthquaker" might flatten up to 100 buildings. Scientists estimate that its blast damage covers an area of approximately 80,000 square yards.

It is streamlined so that it will penetrate into the earth even from moderate altitudes. It carries a delayed action fuze so that the bomb does not explode until it is inside or under its target. The head contains the heaviest possible charge of "a very powerful explosive."

Its extraordinary penetrative power was shown in attacks on the submarine pens at Brest. They were among the strongest shelters ever built by man, with concrete roofs twelve feet thick. The new bombs also have been used with great success in knocking out formidable German long-range weapon sites.

It took only one to put the big German battleship Tirpitz out of action, probably for the duration. They also were used to drain the vital Dortmund-Ems Canal, to crumble the sea walls around Walcheren Island off the Netherland coast where the Germans had long-range guns, and to smash the Kembs Dam in southern France.

(From a news report)

Air-Ground Cooperation in Italy:

An interesting detail of the battle for the Gustav Line was disclosed recently. A force of fighter-bombers was kept constantly in the air above Monte Trocchio, southeast of Cassino, on which a Desert Air Force officer and an officer of the Eighth Army air support control were in a special observation post in communication both with the forward troops and with the aircraft overhead. By this means they received information of enemy targets that were holding up our troops on the ground, and directed bombers onto them. The rapid transmission of target particulars was assured by the use of wireless sets, 3,500 of which were carried by one corps in the operation that took them beyond the Gustav Line into the Liri valley. Men of the Royal Corps of Signals operated many of these sets, and in preparation for our attack laid some 3,000 miles of signal cable for line communications, much of it done under enemy observation and later under shell fire.

(*The Times*, London)

GERMANY

German 50-mm Light Mortar:

The German 50-mm light mortar (5-cm LGrW 36) shown in the photograph is the organic support weapon of the rifle platoon and rifle company. It is often emplaced singly by the Nazis to cover areas of approach into which machine-gun fire cannot be directed. It is also employed as a mobile support weapon for supporting counterattacks. The mortar is a simple, trigger-fired weapon of the usual design. Six of its two-pound high-explosive projectiles can be fired in eight seconds at a maximum range of 568 yards and a minimum of 55.

(*The Field Artillery Journal*)

German Jet-Propelled Fighters:

Here, briefly, are descriptions of the Luftwaffe's jet-propelled fighters:

ME-163.—Single engine, single-seat mid-wing monoplane. Resembles an arrowhead. Wings sharply swept back; short tear-drop fuselage. Tall single fin and rudder. Span, thirty feet; length, twenty feet. Speed, over 500 miles per hour. The 163 is rocket type, employing a single liquid rocket-propulsion unit. The endurance at full power is reported to be only a few minutes, but the jet may be used only intermittently.

ME-262.—Single-seat, twin-engine, low-wing monoplane. Wings are tapered with squarish tips. Slim fuselage has a long nose, with cockpit placed over the wing. Span, forty-one feet; length, thirty-five feet five inches; speed, over 550 miles per hour. In contrast to the rocket-type 163, the 262 is a true jet-propelled fighter with two jet units.

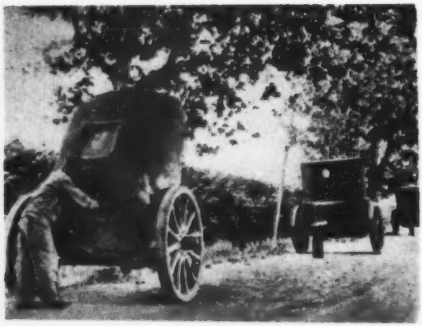
(*Air Force*)

Flying-Bomb Launching Ramp:

The picture below shows a type of flying-bomb launching ramp found during the Allied advance to the Pas de Calais. The ramp is prefabricated and designed to be bolted together section by section. The sloping platform of the ramp has a central slot running up its entire length, and beneath the platform is a continuous cylinder, part of which can be seen in the foreground of the picture. It is believed that this cylinder is a housing for a "driving piston" which, by means of a lug traveling up the central slot, engages the underside of the bomb, giving it the necessary initial stability and impetus to launch it into the air before the bomb's own jet mechanism comes into operation.

(*The Illustrated London News*)

Portable Pillboxes:



These ingenious constructions were found in Italy, in the Vada area, by the Fifth Army. They were intended to shelter German machine gunners charged with the task of holding up the Allied advance. Note the solid tires on which the pillboxes were carried.

(*The Sphere*, Great Britain)

U. S. S. R.

The Soviet Yak-3 Fighter:

The new Soviet fighter plane, Yak-3, is the lightest fighter craft in the world. It is lighter than the Spitfire and the Zero, and achieves this by eliminating all the automatic electrical equipment for boosting speed and performing other functions that most modern planes have. Instead of many switches, the cockpit has many levers, and the pilot does the work instead of the heavy motors. The instrumental panel is reduced to the simplicity of the primary trainer. Many pilots consider the plane the best flying today, and particularly superior to the German Focke-Wulf 190, which it was designed to meet. It is said to be faster, tougher, higher flying, and more maneuverable than the Nazi plane. By lightening his plane and cutting down on wingspread, the Soviet designer, Yakovlev, has achieved more power out of his engine and developed the best rate of climb, according to reports from the European front, of any plane now operating. In appearance the plane is small and light; short nosed, short tailed, and short winged.

(*Marine Corps Gazette*)

"Individual Rafts":

Information from various sources shows that the Red Army makes extensive use of pneumatic rafts, especially in marshy regions where they have given full proof of their worth.

On reconnaissance missions Soviet engineers are equipped for crossing water courses with "individual rafts." The individual raft consists of a cylindrical unit combined with rubber hip boots. The rubber cylinder is constructed in the form of a lifesaver with an inside diameter of forty centimeters and is inflated by the engineer himself. This piece of equipment is held in place around the man's waist by means of canvas straps passing over the shoulders. The individual raft possesses a capacity of 120 cubic decimeters which gives it a supporting force of nearly 120 kilograms, sufficient to support a man in the water with his equipment and arms. Two small wooden paddles serve as oars and enable the man to reach the opposite shore easily.

(*A Defesa Nacional*, Brazil)

ITALY

Present Composition of Italian Navy:

So far as is known, Italian ships now operating with the Allies include five battleships, eight cruisers, over twenty destroyers, and a similar number of submarines, besides numerous vessels of less importance such as war-built corvettes. Tonnage in German hands cannot be reckoned as of much account. There is the uncompleted battleship *Impero*, the badly damaged and probably unseaworthy cruisers *Balzano* and *Gorizia*, a few destroyers, and some submarines. A number of these submarines were last reported in Bulgarian waters and may therefore have been seized by the Soviet Navy.

(*The Navy*, Great Britain)

JAPAN

Japanese Mortars:

The Japanese 50-mm, 10.3-pound, light mortar, shown in Figure 1 with a four-round carrier and a high-explosive fragmentation

FIGURE 1.
JAPANESE 50-MM GRENADE MORTAR.

grenade, is in reality a grenade discharger. The shape of its base plate led to an erroneous conclusion early in the war that the weapon could be fired from the knee; hence the Americanism, "Knee Mortar." Actually, the base plate must be placed firmly on the ground, after which the grenade is inserted, the weapon aimed by sighting down the barrel, and then fired with a trigger mechanism. Throughout its approximate 100 to 500-yard range, Japanese small units employ the weapon with both accuracy and skill.

In the past, 81-mm and 90-mm mortars have not been organic within the Japanese infantry regiment. When necessary, trench mortar platoons containing two such mortars have been attached to the units requiring them. There are two types of Japanese 81-mm mortars. The 81-mm, type 99 (1939), is considerably lighter than our own, weighing only 52 pounds. Ammunition for the U. S. (M43 light) and the Japanese weapons are, however, interchangeable—either weapon can fire the projectiles of the other. The enemy mortar fires a 6¾-pound projectile at ranges between 450 and 2,200 yards. The 81-mm, type 97 (1937) (Figure 2) is almost identi-

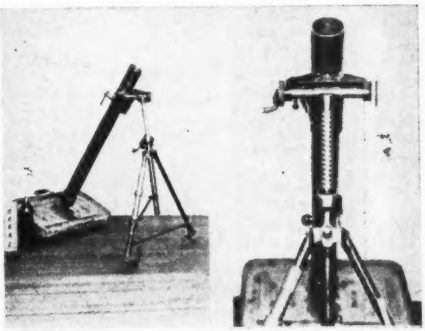


FIGURE 2.
JAPANESE 81-MM MORTAR, M1937(97).

cal with the U. S. 81-mm mortar M1 and could readily be mistaken for it. The ammunition used is the same as that used in

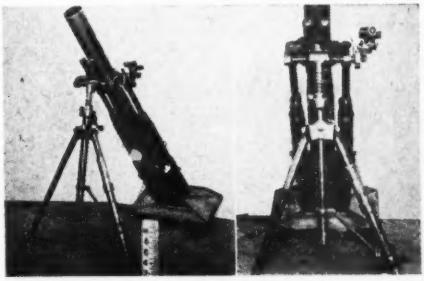


FIGURE 3.
JAPANESE 90-MM MORTAR, "M94."

the type 99 mortar. These weapons when fired have a relatively loud report and a distinct muzzle flash. The 90-mm mortar (Figure 3) also produces a large muzzle flash extending about six feet beyond the muzzle in daylight, but the noise of firing is not so pronounced as with the 81-mm. Normally, the former fires an 11½-pound high-explosive projectile from approximately 600 to 4,100 yards.

(*The Field Artillery Journal*)

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UNITED STATES

The Army's Latest Tank Destroyers:

The 90-mm gun motor carriage M36, shown above, is a tank destroyer firing a 24-pound armor-piercing projectile from its high-velocity gun. Weighing thirty-one tons, it has a speed of thirty miles per hour and can cross a 7½-foot trench.

Below is the 76-mm gun motor carriage M18, a twenty-ton, low-silhouette tank destroyer with a speed of fifty miles per hour. It has torsion-bar type bogie suspension.

(*Army Ordnance*)

Pentolite:

Pentolite, an explosive twenty percent more powerful than TNT, is being used in rocket projectiles. A small quantity of this explosive will blow a two-inch hole through five feet of reinforced concrete.

In addition to providing terrific punch for bazooka ammunition and other rocket projectiles, Pentolite also is employed in rifle grenades, antitank explosives, certain types of artillery shells, for demolition work, and for clearing wrecked harbors such as that of Cherbourg, France.

Pentolite's history began in 1891 with that of PETN, or pentaerythritol tetranitrate, which was invented in that year. They found it so sensitive to friction that at that time it was considered too dangerous to manufacture. Army Ordnance eventually found a way to utilize PETN by mixing it with TNT and thus producing safely and in large quantities the superexplosive, Pentolite.

(*Army and Navy Journal*)

Steel Treadway Bridge, M2:

The Steel Treadway Bridge, M2, is an engineer bridge used to accomplish rapid stream crossings for all vehicles except a few of the largest and heaviest. It may be constructed on either floating or fixed supports, or a combination of both.

The bridge roadway consists of two continuous tracks or treadways formed of steel channels, rigidly connected by steel pins at the joints. Floating spans are supported on pneumatic pontons spaced twelve feet center to center; fixed spans are supported on prefabricated adjustable steel trestles.

Each of the parallel steel treadways has a clear width of 45½ inches, and is made up of twelve-foot units. The steel channel beams, braced by cross beams, are locked to the float saddle.

An engineer treadway bridge company carries enough equipage to build an 864-foot bridge, transported in special treadway bridge trucks and in fourteen 2½-ton cargo trucks. The bridge truck is a specially-designed six-ton vehicle equipped with a power crane, used to handle the heavier units of the bridge. Power boats, outboard motors, air compressors, diving equipment, and other matériel are also carried by the company, which can build an entire bridge in about five hours of daylight.

(*Army and Navy Register*)

FOREIGN MILITARY DIGESTS

Preparation of Infantry for Battle

Digested at the Command and General Staff School from an article by Major General F. S. Tucker in *The Army Quarterly* (Great Britain) October 1944.

THIS war has shown that infantry, *good infantry*, is still the most important arm on the battlefield. It is therefore more important to train this arm and to prepare it for battle than to train and prepare any other arm. Infantry is priority No. 1.

It is perhaps not generally realized that victory on the battlefield depends far more on the approach to battle than on what is done on the battlefield itself. History is brim full of the achievement of the seemingly impossible by troops who are put off "on the right leg" for their fight, and as full, too, of failures by those who are sent in "on the wrong leg." The approach to battle comprises not only the planning and the staging but also the training of the individual and of the mass for the tasks that lie before them. *For the tasks that lie before them*—the likely nature of the tasks has to be ascertained months, preferably years, before our men may be called upon to face them. Always the higher control and direction of training must be in the hands of men of imagination, scientifically-minded and experienced in war. *Men of imagination*—since for war one ounce of imagination and foresight is worth ten tons of experience, especially for us whose experience is always bitter.

Thus, training must always point to the future; from that it follows that a clear and imaginative picture of war as it will be must be produced by those who direct training policy. It is not enough only to look at war as it is, for that attitude brings a supineness that crushes all inspiration in training, leaves the enemy with the initiative in battle, and retards the proper and logical development of weapons and tactics ahead of our enemy. Always we should know in good time how we propose later to fight in order to make the enemy dance to our tune. With this picture before us we can equip ourselves rightly and our training will be inspired, enthused, and interesting. But the picture must be presented to all of us, from the highest to the lowest.

The infantryman's training is now intense like that of the other arms, but his mental and spiritual training are more important than are those of other arms and services. He has a specially dangerous and exacting job, a job more testing than that of the others. He has to endure far longer, in worse conditions, and in closer contact with the enemy; he has finally to close with him, to outwit him in those last few yards, and to kill him, perhaps with his own two hands. And with all this he has to be a quick thinker, a quick actor, and quick on the draw with his hand weapons. There are far too few really high-class infantrymen; those that are high class stand out in any unit clearly from the rest. The really high-class battalion stands out in any division; it is a thing apart and its feel is like a first-class pack of hounds. It is the most powerful thing on the battlefield, the most deadly.

The ground training of our paratroops approximates to the standard that should be

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set for all our infantry. The higher we set the standard the better; one can teach a keen man almost anything. Incidentally, if infantry are really well trained and versatile, then there is no need for such things as "Commandos."

The heart of an infantry soldier must be the stoutest of all; and since it is he who kills most, he must be most skilled in his profession. Finally, he has to be versatile so as to be able to use the enemy's weapons against him and to turn his hand from a heavy mortar or antitank gun to a light grenade or the laying and lifting of mines—his own and the enemy's. And these things not at leisure but in the heat, stress, and urgency of battle, by day and by night.

Our first task is to imbue the infantryman with the fighting spirit, for without it he may as well be driving a bus in England for all the use he will be on the battlefield. The fighting spirit will give him not only the will to fight, but what is more important to him and to this war, *the desire to fight.*

In the main, a high fighting spirit comes firstly from a man's firm knowledge that his highest endeavors even to the sacrifice of his life are worth while, and then from his absolute confidence in his superlative skill at arms.

The important thing is to make the right appeal to the man who is to be so hardly tried in war. When the right appeal has been made and he is satisfied that the appeal is honest and worth while, it will be answered to the limit of courage and endurance; for he is then a very brave man. Without that appeal he is a lost soul and, amiable and idle by nature, he will not exert himself nor be tensed to face a crisis. He needs to be intellectually satisfied. However humble his way in civil life, he is in the habit of seeking this mental satisfaction whenever he is called on for toil or exertion out of the ordinary.

But the appeal *must* be honest. Propaganda is of no use to him; he distrusts it and is very quick to spot it and to scorn it.

Any man who is superlatively good at a game will be seeking to find an opponent on whom to try out his skill. And the better he is at the game and the better his implements the more readily and assiduously will he seek for this opponent; for, however good a sportsman he may be, he will find it more pleasurable to win, even after a hard game, than constantly to lose. The soldier who is far more highly skilled at arms than are his potential enemies and who possesses the very finest weapons will be spoiling for a fight. He becomes aggressive and confident. But one cannot too highly stress the need for the best training and the fact that it is far better to go a little short of equipment on the battlefield so that the man behind can enter the battle as a highly trained fighter, than to have all the equipment up in front and to get in fresh drafts who have never set eyes on the weapons they are to use, who have to be trained at urgent speed on the battlefield, and then enter battle without confidence in their capacity to use them. And this happened with some frequency in the early days of this war.

The foundation of the strength of an army lies in the weapon-training of its infantry. It is only too often that a unit is allowed to get away with an unsatisfactory standard of weapon-training, yet what is the use of having an implement of any sort in any trade if one is not highly skilled in its use? The unit seems good, perhaps; its drill is good; its turnout is good; tactically it seems no worse than others. But its weapon-training is no better than mediocre; it can do all things but kill, and that is the only thing it was ever meant to do. That unit is unfit for battle.

The infantry do most of the killing. Since that is so, it stands to reason that they must be quick, accurate, and deadly with their arms. Too many of them are not. Sometimes they have not been satisfied by their trainers of the necessity for a high standard of skill nor given the determination to reach it. No man is fit to be an infantryman who cannot or will not reach this standard.

It is most difficult to determine at what stage one can tell a body of men that they are highly trained and tell them to be confident that their training will take them

through their first battle. If they are told this before they are in truth ready, then their first battle will be the biggest shock to their fighting spirit that is possible; for one half of that spirit will disappear with the bloody lesson that the enemy are more skilled at arms than are they. It is this first battle that makes or mars infantrymen for the rest of their campaigning. There is no panacea for passing them through it with their tails erect, but the least we can do is not to tell mediocre men that they can look forward to the test with confidence. One has so often seen units and formations in all their pride bite the dust in their first action because they had not realized what they had got to do to prepare themselves for the trial before them.

With a firmly founded fighting spirit and the desire to fight, we have yet to present to our men a picture of battle as it will be. To assist us there will be specially selected men, who do not boast or "shoot a line," to live with the freshmen and to talk to them of battle conditions; and there is what we call "inoculation" for battle, well known to all in the Army. Both these ways of depicting battle are good and they will help enormously in that first test, but there are two other courses that we must take. The first is to give our man a few standards of conduct in battle, to let him know what is expected of him and to show him that if he lives up to those simple standards, his unit will suffer far less than if he falls below them. Such guides as these:

> Positions once taken will never, never be given up while a man can use a weapon.
>
> If a position is "overrun," the garrison fights on.
>
> No man who can use a weapon will be taken prisoner. If, by mischance, he is captured he will do all in his power to escape as soon as possible.

And the second is to give him guides for sudden emergencies. These guides form a part of his battle drill. The reason for them is easy to see. One good thing about any drill is that on the one word of command certain movements are quickly and precisely executed without their having to be detailed each time. Therein lies the value of battle drill. It is to get certain types of action taken automatically.

Battle drill starts with the pair of men, for the pair of men is the smallest tactical unit; it can move and watch; it can fire and watch; it can fire and move. So battle drill starts there.

But there is one thing that we must remember and it is that a battle drill will not last forever; it is better that it should last only for a short time, to be eliminated as soon as it becomes second nature or directly we change our tactical technique, and that technique we must change between each phase of operations if we are to keep abreast of battle needs and to keep ahead of our enemy.

If we are looking for good discipline—and I am emphatic that the true discipline of the good infantryman is far more important and necessary for him than is the particular discipline of any other arm or service in the armed forces—then we will get it by realizing that it depends in the main on the goodwill of all ranks of the unit or the division and therefore on their cheerful determination to do their best wherever they may be and whatever they may have to do. All that goes to make the fighting spirit, goes to make the perfect discipline.

Surprise is the salt that flavors battle. With that as the foundation of his tactical training and the criterion by which all his actions in battle are to be judged, the infantryman cannot go wrong. Battle technique must change constantly and, again I stress it, especially between each phase of operations. It must be devoted towards attaining tactical surprise; it must be ahead of one's enemy and even then we must expect sometimes that a change in enemy weapons or tactics will again force on us a change in our technique.

Thus the infantryman, to whom surprise is more vital than to any other arm for his life hangs by that thread, has his own responsibility *as an individual for studying the tactical ways, habits, and changes of his enemy.*

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This is of great importance. We have forgotten to instil in the infantryman the art of using cunning to induce his enemy to react to anything he does in the manner that he wishes.

With this study comes the devising of action as an individual to take advantage of the knowledge that he has gleaned of the enemy. In other words, the art of a stalker and a sniper. But it is usually too much for a single man to move, watch, report, and act against an enemy. This is better done by two men, and thus the pair becomes the tactical basis of infantry work.

While training to gain information of the enemy by day, the pair will also work to prevent the enemy from gaining information of ourselves; in other words, to stop in their turn his movement and to kill his watchers.

From this stage upwards, through the section and the platoon, the same objects will be put before the infantry; but, as the unit becomes bigger, attention will be paid more and more to night work, and by day to the use of supporting fire and the cooperation of other arms in keeping enemy heads down or in distracting attention from movement. Important is the use of and cooperation with single tanks and sections of tanks. The earlier, too, that the gunner can be included in the training, the better; the more it can be made a rule that no artillery practice takes place without infantry being present and if possible shot over, the better.

An infantryman must know a lot about a tank; if time admits, he must be taught to drive one so that he is completely familiar with the vehicle. Never again should our infantry get an exaggerated idea of the power of enemy tanks against good infantry.

Aimless patrolling is bad. In defense, one's patrols keep the enemy at arm's length; for the attack they probe to find the right place and time at which to hit and to cover the staging of the attack. Chance sometimes offers special and paying tasks. The fact is, however, that one does not "dominate the enemy" by aimless patrolling but by patrolling that pays a good dividend. If it is not paying a good dividend either in information gained or casualties inflicted then there is something basically wrong with it. Aimless patrolling only wearies and sickens your men. A good patrol organization within the division, the brigade, and the battalion will ensure that a dividend is paid.

And what is our final object in tactical training? It is to be able to achieve with the largest infantry formation the most difficult form of infantry operation usually undertaken. That operation is the infiltration attack by a division, by night and by day, with and without tank and artillery support. This amounts to a rapidly planned and coordinated aggressive patrolling or skirmishing by a whole infantry division seeping into its enemy and expanding within his position. Often, the only deliberate part of such an operation is the initial staging of the first phase; sometimes even that is hurried. Pretty well everything purely tactical that infantry has learned, and much of their battle drill, is brought into this operation, and all must be of the highest standard. In particular, communications and their elasticity are tested to their utmost and the slightest weakness will soon be apparent. The artillery and other supporting fire power will be swinging from centralized control and back again.

We must never forget that a good infantryman is a responsible individual; as such, he is responsible for his own physical fitness; he and no one else. To a great extent he is also responsible for his own efficiency as a man-at-arms. Life in herds, first at the apron strings of a devoted mother, and later, with all thought handed voluntarily or involuntarily to some large organization, has an almost fatal effect on a considerable number of our youth; it tends in a soft and insidious way to deprive them of real individuality. This war has been a God-sent medicine to correct this tendency; one hopes that its effects will be lasting. I wonder!

The more we can make our man a fully responsible man the better infantryman he will be. For instance, a man is responsible for his own feet if anyone is, and it is hard to see why an NCO or an officer should have to inspect the feet of a trained man. If his

feet fail him and he has not cared for them, then he must get the punishment he deserves, and let that punishment fit the crime. There has been in the past far too great a tendency to take all responsibility off the shoulders of the individual. Things are better now in the Army and it is imperative that they should be better in civil life. The tendency must be rather to thrust responsibility on to him, and the more the better, for it allows the NCO and officer more time to use their brains, to get their command to a higher standard of training than ever before, to improve the material with which they have to deal, and in action to think and to plan ahead.

There are so many wise men who say that we must be ready to go into battle without the support we should have. We have heard that we, the infantry mainly, must be ready "to do without" air support, "to do without" tank support, without artillery support. There is only one answer to these "do without" proposals and it is that we expect these things and will demand them whenever and wherever they are needed to bring an operation to a successful conclusion. The object of all of us is the same—it is to destroy the enemy at the least cost to ourselves.

Five Years of Sea Warfare

Translated and digested at the Command and General Staff School from a German article by Heinz Bongarts in *Das Reich* 27 August 1944.

This article by a German writer is a very interesting and frank discussion of the superiority of sea powers over land powers. Sea powers can become land powers in the course of a war, but land powers find it impossible to become sea powers.—THE EDITOR.

IF we cancel out the normal continental Germano-Russian conflict, then we have, in Anglo-America on the one side and Germany on the other, sea power and land power opposed to one another. Germany did possess war vessels, it is true, and England armies. But that was, in our case as in theirs, incidental. Predominant land power stood opposed to predominant naval power with a habit of thinking in terms of naval strategy. The land-bound might was powerless against the sea-bound power. The naval power, on the other hand, was powerless against the mainland forces.

Anglo-American naval power was forced to the recognition of the fact that naval power alone was helpless against the blockade-proof German continental position. The Allies sought to solve the problem by means of amphibian operations against the exposed southern parts of Europe. They sought, as Germany had done before, to solve the problem by means of strategic bombing. Since it brought no decision against the German continental position either, the oceanic powers were forced to acquire land forces for themselves in order to engage the German land forces on the continent. But here lay, and here lies still, the distinguishing difference between the German and the Anglo-American sides. While the creation of powerful armies during the short period of the duration of a war is quite possible, this possibility does not exist as regards a navy. The construction of a battleship or of an airplane carrier requires almost four years, to say nothing of the four years required for extremely precise and specialized training. Germany, therefore, was not able, as were the sea powers, to obtain the proper weapons while the war was in progress. She was compelled, with her limited naval forces, submarines, and small units that could be built during the war, to seek to attain whatever results she could. After these forces were exhausted, after their action came to an end, she was forced, at first, to abandon the seas to her oceanic opponents and await them, army against army, in a decisive battle on the continent.

The story of the small fleet, still but mid-

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way in the course of its development, with which Germany entered this war appears to many like a political story. German efforts from 1933 to 1939, and even beyond this, were of the most honorable ever known in the history of statesmanship. Back of it was the readiness to forego the possession of naval power and of world power and to maintain only fleets of such power as seemed necessary in case of a continental dispute. And Germany's sacrifice in the field of naval construction was made in favor of the attainment of a great political objective. It was made, likewise, because of Germany's belief in peace, which involved the abstinence from all over-hasty naval construction even within the limits of the German-English naval agreement.

In 1939, Germany was forced to abandon the policy that she had desired to pursue of doing without naval power. It did not yet appear too late. Free of political shackles, the plan for an appropriate German fleet began to take form.

How many ships did the German navy possess in 1939? She had two 26,000-ton battleships, the *Scharnhorst* and the *Gneisenau*. The first major German battleships approaching the size usual in other countries, that is, the *Bismarck* and *Tirpitz* (35,000 tons with eight 38-cm guns each), were completed in 1940 and 1941. Germany had two airplane carriers of 19,000 tons under construction in 1939 of which the *Graf Zeppelin* had been launched although neither ship was ever completed. There were also five heavy cruisers. Among them were, however, three 10,000-ton armored vessels (pocket battleships), the *Deutschland* (later the *Lützow*), the *Admiral Scheer*, and the *Admiral Graf Spee*, which also had come into being under the limitations of the Versailles naval restrictions. They had a speed of twenty-six knots per hour and carried six 28-cm guns. New and powerful were the two heavy cruisers, the *Admiral Hipper* and the *Blücher*, each of 10,000 tons, with eight 20.3-cm guns. A third cruiser of this type, the *Prinz Eugen*, was still under construction. Finally, there were six light cruisers, from the *Emden* to the *Nürnberg*. All of them had been built in accordance with the Versailles specifications. Some twenty destroyers, new ships of from 1,600 to 1,800 tons, had been finished. There were also twelve older torpedo boats and a few dozen speed boats, as well as a considerable number of auxiliary vessels.

The submarine fleet, in addition to a considerable number of small, non-ocean-going submarines, had eighteen larger submarines suitable for the Atlantic service—a number which, in view of the increase during the war and subsequent accomplishments, is to be considered as almost nothing.

In September 1939 this fleet found itself opposed first by the English and French and afterwards by the Russian and American fleets.

To be sure, Italy entered the war on the German side with six battleships completed and two under construction, seven heavy cruisers, fourteen light cruisers completed and fourteen under construction, about 120 destroyers and torpedo boats, and about an equal number of submarines, and tied up large portions of the enemy's fleets. But Italy was incapable of taking advantage of her initial opportunities and of taking a bold risk. She soon owed her existence to the help given her by German seamanship. The powerful, capable, brave Japanese fleet, consisting of nine battleships, nine airplane carriers, twelve heavy and thirty light cruisers, 150 destroyers, sixty to seventy submarines, as well as an unknown but large number of ships under construction at the beginning of the war, came in on the German side and tied up the greater part of the American fleet in the Pacific. The French fleet left the war or was lost, as was also the Italian fleet in the maelstrom of events. But the enemy naval units remaining in the Atlantic and European waters were ten, twenty, even thirty times our superior.

There is a certain tragic feature connected with German naval operations in the two World Wars. The first World War found Germany in possession of the second most powerful navy in the world. But this fleet remained imprisoned within the narrow confines

of the German Bay. In the second World War, the free European coast from the far north to the Bay of Biscay was open to the German naval command. But this time, the powerful fleet was lacking.

The Norway campaign long ago became an epic of boldness. It established the great preliminary prerequisites for naval warfare, which were afterward completed by the campaign in the west. In the battle of Norway, Germany sacrificed the heavy cruiser *Blücher*, the light cruisers *Karlsruhe* and *Königsberg*, no less than ten destroyers, and a number of submarines and auxiliary ships. If ever a little navy threw all it had into the fight, risked everything, made use of every operational and tactical possibility to the very limit, the German Navy did. Conscious of the impossibility of any naval decision whatsoever, she put her entire strength to bear against the enemy's lines of communication. These operations offered the possibility of avoiding the crushing naval superiority of the enemy and of dealing him a hard blow. German surface craft, one after the other, broke through the English blockade between Greenland and Scotland and operated against British shipping and convoy routes in the Atlantic. Auxiliary cruisers pushed their way as far as the Indian and Pacific Oceans. The journeys of the *Admiral Hipper* and *Admiral Scheer*, with the almost total destruction of entire convoys, have become milestones in the history of naval warfare. So were the exploits of the battleships *Scharnhorst* and *Gneisenau*. When the *Bismarck* and *Prinz Eugen* were ready for service and broke through into the Atlantic, it was already too late. The English naval might had fallen back on American technique and had built up its air component so that the employment of single costly ships or groups of them without carrier escort and fighter protection was impossible. The *Scharnhorst*, *Gneisenau*, and *Prinz Eugen* remained for more than a year in French and Atlantic ports in a continual battle with the growing enemy air power, devoid of any opportunity for major operational employment. In a bold dash, they finally found their way through the Channel to a home port and a Norwegian port where they then found employment.

Under their coats of camouflage paint, the auxiliary cruisers *Atlantis*, *Orion*, *Meteor*, *Thor*, *Cormoran*, *Pinguin*, and *Komet* continued to operate, at first, over all the seas. The *Pinguin* was taken by her daring pilot through the Arctic Ocean to the Pacific. The sinking of the British cruiser *Sidney* by the little auxiliary cruiser *Cormoran*, which was nothing but an armed merchant vessel, was a unique feat.

The submarine fleet, which Germany had been able to bring into being in the short period of from one to two years, continued to grow. Only a part of the available boats were used against the enemy in 1941. A part of the few submarines had to be used for the training of the many necessary crews. Of the remaining boats, because of necessary temporary removals from service or overhauling in the yards, only about a third were in use at any one time against the enemy.

And so everything that was accomplished up to 1941—up to one hundred thousand gross registered tons were often sunk in the course of one month—was done by a few boats which singly attacked the enemy convoys and picked off their victims. Their successes were in inverse ratio to their numbers. When assembly-line methods of submarine production had been perfected and the mass training of crews had gotten under way, the submarine advanced to the great attack at almost the same time that the hopes of success by surface vessels on the Atlantic disappeared.

Let us unfold the panorama of the great submarine attack of 1941, which lasted till the spring of 1943, and of the mighty and most unique naval feat of a nation which essentially was devoid of naval power. It is unnecessary to call attention to the endless number of victories—the sinking of entire merchant fleets. Led by their daring admiral, replying to the massing of enemy convoys by the massing of submarines against the convoys, and with the help of radio and of a strategic system of centrally-controlled, long-range command over all the seas, the sub-

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marines carried on a surprisingly far-reaching activity. "Pack" tactics became a universal concept; the convoy battle, a new form of naval warfare. The sinkings of a single battle added up to a hundred thousand and more gross registered tons. With the growth of the submarine fleet, the number of the convoys that could be attacked increased. The enemy found himself in the greatest of crises. Only the accession of neutral fleets and the entrance of the United States into the war kept England from the end. The Americans instituted enormous programs of ship construction in order to bridge over the immense losses on the basis of passive defense, that is, to build ships faster than they were lost. The enemy put hundreds of new convoy vessels into service, providing the convoys with airplane carriers and airships. He put hundreds, finally thousands, of planes to patrolling the Atlantic. The enemy engaged whole air fleets in the task of destroying the submarine bases on the Atlantic. The construction of huge bunker yards of concrete and steel denied him success. It became evident that the offensive powers of the navy lay in the submarine arm and that it was becoming an operational sword. The submarine fleet appeared to many to exercise a sort of mastery over the seas—a type of sea power dictated by the limitations of war. But its men, knowing its limitations, in the increasingly hard battles remained true to the words of their Führer: "We are waging a submarine war because we are not a sea power. . ."

In the fourth year of the war, when in the greatest of distress, the great sea powers, thanks to their technical inventiveness, discovered the way to reduce the ability of the submarines to approach unseen and to appear unexpectedly on the scene, and thereby struck a blow at the roots of the operational possibilities of our undersea fleet. The great submarine attack began to diminish in intensity and a pause occurred. It was a vital blow, which crippled the only German offensive weapon on the seas for an indeterminate time. The German command put all technical and human forces to work at the long task of either overcoming the enemy's new development or of annulling its effects. Operations were shifted to the field of technique. On the other hand, they compelled the enemy, at the same time, by means of a continuation of the submarine warfare even at a high cost, to maintain intact his entire defense system, which tied up thousands of enemy ships and planes. At first, the shift of the German naval operations to the defensive became the determining fact, and in the following development—the leap of the sea powers to the continent—the most fateful fact.

But what does all this mean? The smallest and, at the beginning of the war, most incomplete fleet belonging to a major power forced the enemy, through the daring, skilful, reckless employment of all its means, through the extraordinary ability and bravery of its men, to assume the defensive for a period of three and a half years and, strange as it may seem, assumed the initiative. The mode of conducting operations employed by the great sea powers was the result of increasingly strenuous defense efforts. Not till the second half of the fourth year of the war did the sea powers succeed in obtaining the mastery in the Atlantic theater of operations. For years, the Navy had blocked the increasingly evident intentions of the sea powers to attack continental Germany in rear. Not till the fifth year did the sea powers succeed in concentrating their forces before the gates of Europe and in making their landing on the continent. With the concentration of the naval forces of the sea powers and the forces of their newly created land formations before the gates of Europe, and with the beginning of the decisive struggle between continental and sea power on the soil of the mainland, the war has entered a new phase which is to decide the fate of Germany and Europe, that is, the assertion of a new Europe with Germany as the power-radiating nucleus in a new world. Here the vital decision will be made.

Naval warfare in its pure form moves into the background. But regardless of what the developments may be, one lesson from this

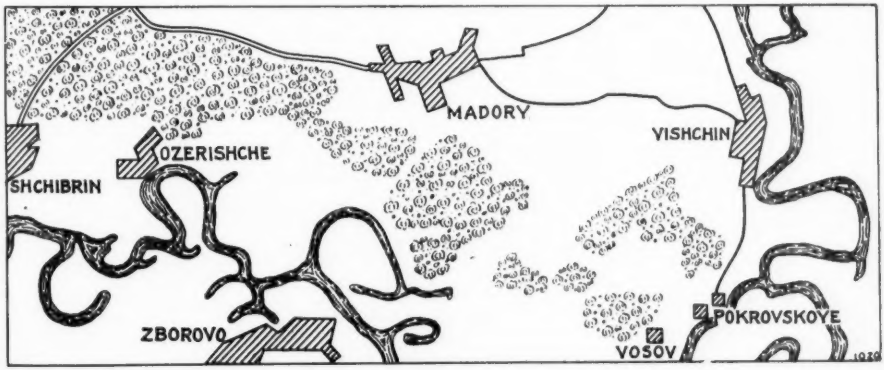
war will, after the successful termination of the raging, decisive battle, always exert its influence on future naval activities. It is the lesson which teaches that Germany, as well as Europe, cannot act according to her will without the ability to act on the sea. The interference of the great sea powers has again become a fateful factor in this war. Against them, after the decisive continental victory, weapons will be forged in a Europe which will exist in a new world of great continental structures.

A Battle with an Open Flank

Translated at the Command and General Staff School from a Russian article by Lieutenant Colonel J. Fomin in *Krasnaya Zvezda* (Red Star) 1 April 1944.

DURING rapid advance our troops often fight with one or sometimes both flanks remaining open. The problem of protecting the flanks is solved each time depending on the situation. A recent battle experience of one of our infantry divisions is very instructive and characteristic in this respect.

The enemy had established his defensive position on the right, elevated bank of a river. The most important villages along the river—Vishchin, Pokrovskoye, and Vosov—he transformed into centers of resistance and concentrated there considerable forces with mortars and artillery. Enemy reserves were located in the depth at a distance of about five or ten kilometers from the forward edge. An infantry battalion with five to eight self-propelled guns and tanks was at Madory. Two or three full-profile trenches with an extremely ramified net of communication trenches had been established along the entire forward edge of defense. A large area in front of the trenches was mined. In addition to fortifications constructed by the enemy, the river itself, with its steep right bank, presented a serious obstacle for the attacking forces.



Our units were confronted with the following task: to force the river, take the enemy's fortified defensive position by assault, and capture a town in the depth of the enemy defense. It should be noted that the left flank of our formation remained open and unprotected. Taking this into consideration it was decided to send a special mobile group, which was to follow along the wide valley of the river, into the rear of the Germans. Then it was to penetrate into Madory where another enemy line of defense had been established, disrupt the enemy's communications, and produce panic in his rear. The main forces of the division were to force the river south of the village of Vishchin.

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It took a long time to prepare for the attack. The preparations were quite elaborate and secret. H-hour was fixed for the morning and announced a short time before. Noiselessly and in concealment, the units advanced to their line of departure for the assault of the enemy bank of the river. The units halted, in prone position, at a distance of about 150 or 200 meters from the German forward edge. They approached the bank at night according to plan so as to be at their respective places an hour or an hour and a half before the start of the assault. A great number of guns were detailed to silence enemy firing positions by direct fire. Dispatched the evening before the attack, detachments for clearing minefields made passages in the German minefields and barbed-wire entanglements.

For fifteen or twenty minutes the artillery shelled the forward edge; then it transferred its fire to the depth of the enemy defenses, and infantry units launched the assault. The men quickly climbed the steep slopes of the western bank, broke through the forward edge, and cleared the first line of trenches. Not allowing the enemy to recover, the units of the division reached Madory and captured the village.

What was occurring meanwhile on the open left flank of the division? The mobile group had managed to fight its way into the rear of the enemy. Part of its forces had to fight against separate German groups. The other part of the group, having entered the forest northeast of Shchibrin, had encountered considerable enemy forces and was stopped. The group had not accomplished its principal mission, although to a certain extent it helped in the capture of Madory.

Thus, the left flank of the division was exposed and threatened by enemy units occupying the village of Zborovo, where the Germans had concentrated considerable forces. The enemy could strike at any time at the flank and rear of the division. It was not expedient, however, to detail a unit for the special purpose of protecting the flank, for it would have weakened our attacking force and would have slowed down the tempo of the operation. The commander decided that the only correct way to protect the flank would be by a fast and decisive advance of the division for the purpose of seizing the next enemy line of defense running through Shchibrin and Ozerishcho, and striking at the flank and rear of the enemy group in the vicinity of Zborovo. It also became obvious that a quick capture of Shchibrin would result, first, in securing the open flank by compelling the Germans to abandon the bridgehead on the left bank; second, in capturing another defense line; and third, in dismembering the main forces of the enemy. We found out later that this thrust had accomplished another mission: At that time the Germans had concentrated in the woods north of Shchibrin a considerable force of tanks, self-propelled guns, and infantry in order to strike at the right flank of the division which had advanced so far ahead. But since Shchibrin was occupied by our units, this force found itself in a critical situation.

The most important element in the accomplishment of the above missions was determination and rapidity of action rather than numerical superiority in manpower and equipment over the enemy. The advance guard dashed forward. It was well supplied with weapons, particularly with infantry and antitank artillery. The mission of the unit was to advance rapidly on the road from Madory to Shchibrin, to occupy it, and to consolidate their positions on its western and southwestern outskirts.

This decision proved to be perfectly justified. The German garrisons which remained on the left bank of the river and threatened our left flank found themselves in a difficult situation. Our division was on the right bank and in the rear of the Germans. The enemy tanks which were concentrated in the woods north of Shchibrin were knocked out by the antitank weapons of the advance guard. Having captured Shchibrin, the men reformed their ranks and, without losing time, continued to advance.

This example wholly confirms the rule that rapid advance and fast tempos of attack are very effective for protecting an open flank.

RAF Night Photography

Digested at the Command and General Staff School from an article "from an official source" in the *Journal of the Royal United Service Institution* (Great Britain) May 1944.

IT IS odd to reflect that, less than thirty years ago, when the first squadrons of military aircraft crossed to France with the British Expeditionary Force, the High Command considered their part in warfare would be confined, almost exclusively, to reconnaissance. Yet such was the case. Both the Central Powers and the Allies in the war of 1914-18 began the fight with a fixed opinion that the part of airplanes in their plans was limited to the detailed observation of one another's movements and positions, and the first aircraft to fly over combat areas were armed only with cameras.

In the present war, although the camera plays a very active part, in the sphere of bombing it is secondary to striking power. So complex has the air war become, however, that photographic records of targets, obtained before, during, and after the attack, are essential to the planning and execution of the war as a whole.

Night photography was not practiced in the first World War and aerial reconnaissance was limited to good daylight pictures. This was partly because the science was in its earliest infancy, but there can be no doubt that, had the war been less static and the occasion for night photography correspondingly urgent, research would have penetrated a good deal farther. As it was, experiments were well advanced when the Armistice came in 1918 and some extremely promising night photographs had been obtained from aircraft over East Anglia. The cessation of hostilities put an end to further research, and in the interests of economy no more experiments were made.

In May 1940, however, when the Battle of France was raging, the first air photograph of the RAF was taken by night over a railway yard on the Continent. It was a success and immediate arrangements were made to develop the art to its fullest extent. The remarkable progress achieved in a comparatively short space of time makes a fascinating page in the history of the Air Force. Today each bomber leaving the base for an operational sortie carries an automatic camera which will bring back a record of the target as it appeared a few seconds before the impact of bombs.

In the interval between the close of the last war and the outbreak of the present war great strides were made in increasing the sensitivity of photographic materials. Prior to this, limited sensitivity had hindered the development of night photography; necessity to "stop" movement by short exposure led to under-exposure. With greatly increased sensitivity, however, experts began to concentrate research upon two main factors; these were (a) should an instantaneous exposure be made during the explosion of a comparatively slow flash, and (b) could a flash be designed that would be quick enough yet sufficiently intense to give a satisfactory image while the shutter was held open in a "time" exposure?

The F.24 "Automatic" was a compromise. This standard camera was modified and fitted with a rapid-action "Louvre" type shutter which was opened by hand and closed through the action of a photo-electric cell actuated by the light of the exploding flash. The flash was formerly dropped by the wireless-operator when the bomb-aimer reported "bombs gone." This was the type of night camera in use when bombing ground targets became a regular feature of the war in 1940.

The reason for taking photographs of a target at night and during the actual bomb-run of the aircraft is not, as might be supposed, to record the bursting bomb and arrive at a preliminary assessment of the damage. Results of the bombing are invariably assessed by daylight pictures. Night photography is designed to establish whether or not the selected target has been found and hit. As the air war advanced certain self-evi-

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dent facts emerged on this particular subject. It was found, for instance, that the presence of other sources of light over the target materially interfered with the success of the picture. The photo-electric cell was often prematurely operated by a searchlight beam, and while it was one thing to secure an excellent picture by night over a peaceful countryside, it was quite another matter to "frame" accurately a target area when the camera was moving across a background of searchlights, tracer bullets, flak bursts, flares, and fires started by predecessors. It was also found that, to be 100 percent successful, the entire process should be automatic. The photograph was always taken at the peak of the expedition—at the moment the bombs were falling on the target—and at this particular time each member of the crew was fully occupied with his individual task.

The problem of interference from rival sources of light was surmounted by further modification. The "Louvre" type shutter was replaced by a focal plane shutter modified to give the effect of a "time" exposure during which period the flash was pre-set to explode. This equipment came to be known as the Simplified Night Camera and is now in general use.

The answer to the second principal difficulty was effective automatic synchronization. The shutter had to open for a minimum period and that period had to be illuminated by the maximum amount of light. Complete synchronization was obtained with the introduction of the latest flash-bomb, which has been given a good deal of publicity since it was viewed at the recent RAF Photographic Exhibition in London. Today, the aircrew have very little to do with the taking of a picture by night. The bomb-aimer is the only man concerned, camera and flash-bomb having been loaded by the photographic ground staff before the aircraft left the base, and the process is set in motion immediately the bomb-release key is pressed. The flash-bomb, stowed with the normal load, is automatically released and simultaneously the camera is set going, the shutter opening four seconds before the flash and remaining open four seconds afterwards. In this way, far from proving a hindrance, the rival sources of light supply the plotters at base with abundant information regarding the position of flak batteries, searchlights, decoy fires, and the ground fires already started by attacking aircraft.

The flash-bomb lights up the scene for 1/30th of a second. It has an estimated candle power of 170 millions, which compares with the 3 to 4 million candle power of earlier flashes. It looks very similar to an ordinary light bomb, measuring three feet in length by four and a half inches in diameter. It is fuzed to explode at approximately half the height at which the aircraft is flying. The tail, which is rather smaller than that of the normal bomb in relation to its size, is contrived to make the flash trail farther behind the aircraft, and this "drag" enables it to light up the area without coming into the camera's field of view. The bombs fall faster than the flash and are just about to hit the target when the flash explodes. The reason why the shutter is timed to remain open for a few seconds before and after the flash is to allow for a small margin of error in the explosion of the fuze.

The weight of the F.24 camera is twenty-eight pounds. It has interchangeable units and films 125 exposures. The photograph taken over the target is known as the "bombing frame," but both before and after the frame is photographed the camera is taking other records; the film automatically winds over and the shutter opens and closes several times while the aircraft is over the target area. Sometimes ground detail is obtained in these photographs by means of illumination afforded by the flash of other aircraft. The movement of the aircraft is recorded as a streak across the film and when evasive action is taken this streak is curved or looped. Superimposed upon the film is a record of all other sources of light on the ground.

Nowadays RAF photographers do not fly on operations. Their work essentially relates to the setting of equipment before the

flight, its installation in the aircraft, its maintenance, and the rapid developing and printing of results obtained. All this is carried out at the base. The photographers are patient, highly-skilled men and women; and a large measure of the success of our bombing offensive is attributable to their labors. Photographs are often required at very short notice and sometimes have to be rushed from the aircraft and developed immediately. This can be done in seven minutes when speed is essential. As long ago as December 1940, the photographers were turning out prints on bromide paper at the rate of five hundred an hour. Men and girls engaged in this work were often professional photographers before the war, but many have been trained since entering the Services. All undergo a fourteen weeks course at the RAF School of Photography.

Although the aircrews are not primarily concerned with the taking of photographs, the science has a place in their training schedule and a certain amount of time is spent teaching them the basic facts of the camera's work.

Photographic interpretation is a separate branch in the RAF and its staffing is distinct from that of the photographic. Interpretation is a very highly-skilled occupation; aerial views meaning little or nothing to the layman mean a great deal to the experienced interpreter. From time to time aerial views of the damaged cities of the Third Reich have been published in the press; and although, in many photographs, the havoc wrought by high explosive and incendiary bombs is quite obvious, in others the bird's-eye views of "before and after the attack" do not appear to reveal any great changes. This is because the finer points of interpretation have been missed; they are not obvious to the naked eye. For one thing, scientific deduction plays an important part in the correct reading of an aerial photograph and for another, interpreters employ special apparatus when searching for factors they will embody in their reports. The correct reading of shadows is important.

The Nazi attack on Russia in June 1941 was anticipated by the enemy's inability to prevent the Allied camera from spotting the movement of material to the east. The type of traffic outside a factory indicates what sort of work is going on inside the building; a loop line on a railway may suggest the presence of a battery; tiny white circles of upturned earth indicate cable laying. These are some of the points which tell interpreters facts they seek to establish or corroborate from previous pictures, but night photographs are necessarily limited in the amount of subject matter they reveal. One can be quite certain, however, that they do reveal a good deal beyond answering the question—was the target found and bombed?

Until recently night photographs were always of the vertical type, but recent development indicates that the time is not far distant when the field of night reconnaissance will be as wide as that of daytime, both in the taking of vertical and oblique pictures from the air.

The taking of moving pictures is primarily a daylight occupation, but some highly successful reels have been taken by night. Some of the best moving pictures of this type were taken during the 1,000-bomber raid on Bremen in the early summer of 1942.

Even though the more immediate problems of night photography have been solved the science is not at a standstill. In no other sphere is a more intense period of research continuing, and adjustments, adaptions, and experiments of all kinds are being made and tested with new apparatus day by day. As the air war reaches its climax some of these experiments will be incorporated into the routine of night photography.

One of the highest and most rare talents of a general consists in profiting from the mistakes of the enemy and promptly repairing a reverse.

—Napoleon

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Strategy of Encirclement

Digested at the Command and General Staff School from an article by Major General N. Belayev in *Information Bulletin*, Washington Embassy of the USSR, 5 August 1944.

THE idea of encircling and annihilating the enemy has attracted military leaders of all times and peoples, because of the decisiveness of the aims achievable by such an operation. Military history knows of many attempts made on a strategical scale to surround the adversary, but it knows practically no instances of complete encirclement; in other words, encirclement as a result of which the enemy is captured or annihilated to a man. The reason is the high demands which such an operation makes upon the troops and their commanders, and also the difficulties and contradictions that arise out of it.

Only an army which is far superior to its adversary can hope to succeed in such an operation. It must be capable of far greater and more sustained effort all through the operation than is the enemy. It must be better trained.

But even the best army can achieve the full aims of encirclement only if its commanders are infinitely superior to the commanders of the army to be encircled. This superiority must be maintained all through the operation and can only be so maintained by an unremitting effort to solve the countless contradictions that arise in the course of the operation.

This is borne out even by the examination of but one group of these contradictions, namely, that which relates to the speed of the operation.

The complexity and extreme diversity of the operation of encirclement calls for the most careful preparation. The time required for such preparation exceeds that of any other form of strategical art. Yet, as experience shows, this operation can succeed only if it takes the enemy by surprise, and that can be achieved only by rapidity of preparation. That is the first contradiction.

At the beginning of an operation the bodies of troops carrying out the enveloping movement must move toward each other at high speed in order to close the ring around the enemy as quickly as possible. If the enveloping groups delay in doing this, or if they allow themselves to be diverted by other actions, time is lost and the whole operation threatened with failure. On the other hand, the adversary, as soon as he detects the enveloping movement, strives to retard it by striking at the flanks and the rear of the enveloping troops, with the purpose of forcing open the pincers. If the enveloping troops themselves halt to parry these blows, delays arise which may be fatal to the encircling operation. This is the second contradiction.

When encirclement has been completed there arises the problem of liquidating the surrounded adversary as quickly as possible, either by taking him prisoner or annihilating him. Experience, however, shows that if the adversary puts up a stubborn resistance the process of liquidation will require no little time, and in the interval the enemy may succeed in bringing up reserves for the rescue of his surrounded troops. That is the third, and by no means last, contradiction of the numerous groups of contradictions characteristic of encirclement operations.

Not every army is capable of solving these contradictions.

Stalingrad, 2 February 1943! These words glow more brightly than Cannae, 216 BC. History is indeed unfamiliar with an encirclement operation in which the surrounded adversary made such desperate but unsuccessful efforts to break the ring of encirclement from the outside as did the Germans at Stalingrad. History is unfamiliar with an encirclement operation so bold and original, but which nevertheless conformed so rigidly to all the demands of military art. The operation which ended in the complete encirclement of the German army at Stalingrad enriched the art of strategy.

In the first place, it was a revelation in the use of large armored formations in coordination with aircraft, infantry, and artillery in an encirclement operation. Prior to Stalingrad no one, not even the Germans, had succeeded in achieving such perfect coordination of these arms. In fact, one of the reasons for the failure of similar attempts at encirclement by the Germans was their inability to achieve such coordination.

A major contribution to strategical theory was the idea of creating an external ring of encirclement. This outer ring affords to the troops directly carrying out the encirclement effective protection from enemy reserves hastening to the rescue of his surrounded troops. It obviates the necessity for fighting on two fronts and enables the troops to concentrate their attention on liquidating the surrounded enemy. The external ring is an absolutely original method of insuring the success of an encirclement operation. At Stalingrad this idea found its fullest expression in the action of Soviet troops operating from the area of the middle Don and in the defeat of Field Marshal Mannstein's army.

Lastly, the Stalingrad operation made valuable contributions to the art of liquidating the surrounded adversary. The principle of splitting up the surrounded forces and annihilating them piecemeal, while at the same time constricting the ring of encirclement, is the only correct one. Never before has it been carried out with such fullness as at Stalingrad.

Stalingrad is not the only encirclement operation to the credit of the Red Army. K o r s u n-Shevchenkovsky, Bereznegovatava-Snegirevka, Arbuzovka-on-Don, and Razdelnaya, to mention only a few, are also examples of such operations successfully carried out by the Red Army in this war.

These operations demonstrate the Red Army's ability to practice encirclement as a means of achieving decisive victory. But the Red Army does not make a fetish of encirclement, or an end in itself; it regards it as only one form of strategical art, on an equal footing with other forms. It does not make it a routine to be applied under all conditions, but only when it is considered absolutely essential after a thorough and scientific analysis of circumstances.

Trenches and Emplacements

Translated at the Command and General Staff School from a German article by Lieutenant Colonel Kolb in *Vierteljahreshefte für Pioniere* No. 4, 1943.

SINCE the artillery battles of the first World War and the entrance of the air and armored arms into combat operations, the construction of positions has been in a state of evolution characterized to a greater or lesser degree by the ideas of looseness, defensive zone, antitank protection, and concealment rather than by any particular change in their structural form.

War of movement, after the force of an adversary's attack has worn away, slows down into a war of position which in the first phase of mutual exhaustion has as its immediate result the establishment of two opposed systems of trenches with a number of covered structures (Figure 1). Recuperation of one of the two sides causes certain focal points of the front to become battle-

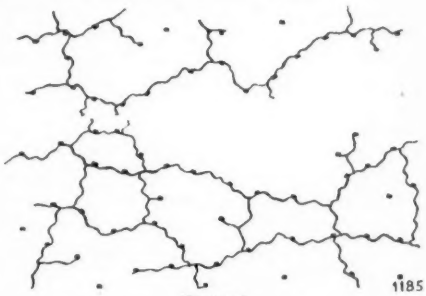

FIGURE 1.
TRENCH SYSTEM IN A QUIET POSITION.

fields in which, before the beginning of the attack, the defense installations are extensively reconnoitered and mapped by the highly developed air photography. But in the attack itself nearly all recognized fortified positions are pounded, demolished, blinded, or held in check by artillery shelling in order to clear a path for tanks, infantry, and airborne forces.

In the case of the great battles of Verdun, on the Somme, and in Flanders, it was for the most part a few unnoticed machine-gun nests hidden in the terrain and a few skillfully camouflaged batteries and individual guns that maintained the resistance of the defenders while infantry trenches and approach and communication trenches, which had been built at the cost of the greatest of pains, were destroyed along with their occupants before their weapons had been able to make themselves effective (Figure 2). At Sevastopol neither the real fortified works nor the few infantry trenches built by the Soviets caused the most difficulty, but the liquidation of the extremely numerous scattered emplacements which were easily concealed among the trees and bushes of the rugged mountain terrain and thus escaped air photography and ground reconnaissance. All this rendered the entire planning of attack especially difficult.

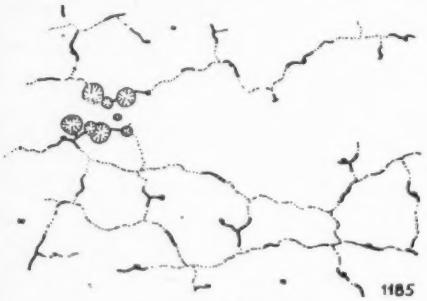

FIGURE 2.
TRENCH SYSTEM IN THE CASE OF A MAJOR BATTLE.

And so the following questions present themselves:

a. To what extent is a system of trenches of value in modern fortifications?

b. When do they have to be reinforced by means of scattered emplacements which are not connected with one another by trenches?

c. In what cases can one do without any trenches whatsoever, relying on emplacements?

Open trenches in open terrain cannot be concealed from enemy air reconnaissance by any means whatever. Covered trenches, because of the considerable amount of labor and material required in their construction, can be built for short distances only and require careful camouflaging. In contrast with this, individual installations and emplacements, except under very exceptional circumstances, can very easily be concealed from ground and air reconnaissance in almost any terrain by skilful study of the latter and careful execution of the work.

During lulls in the battle, trenches permit movement without the enemy's observing it, afford partial protection from his fire, and because of the constant contact with comrades largely prevent the development of a feeling of isolation. Continuous trench systems are constructed when the position is close to the enemy and under his energetic and watchful action, keeping the forces continually in the ground. On the other hand, in fields torn by shell and bomb craters all movement, contact, defense, and assembly for attack have often been carried on for weeks solely by moving by bounds from cover to cover. The casualties have often been much fewer than in the case where forces were maintained immobile in their system of trenches exposed to a barrage.

A short distance back of the main line of defense the need for infantry trenches, as well as for communication and approach trenches, decreases. Fire density decreases while terrain features, plant growth, and artificial structures can be used more and more in concealing movement and as bases for fortified positions; movement in the open is more and more preferred to the confinement of the trenches. Thus, trench systems in the rear of the main field of action are not so much due to enemy pressure as to the or-

ders of the commanders who see in the trenches a reinforcement of defense strength, better coherence, and a reduction of casualties. But this is, as shown above, a deceptive belief.

Tactical liaison among the separate weapon nests is effected by means of sight and fire [exact translation]. Individual nests can be combined to form a closed defense front or a hedgehog position. The forces are bound together, and the influence of the commander on them is sufficiently assured by means of strong unification of the emplacements (centers of resistance, strongpoints) in the defensive zone with the areas that are less exposed to enemy fire and have more cover. Moreover, the commander can reach his emplacements more safely and rapidly in the groping and uncertain enemy fire than by a trench covered by aimed fire. For the nests themselves, the connecting trench is a certain give-away—like an index finger to the enemy aviator and his artillery. The tank, the weakness of which lies in obscured vision, possesses in the trench a guide line for use in rolling to the position. Furthermore, in the construction of positions as a whole every trench system is an insatiable waster of forces, for many men are out of action and engaged in the construction of various important installations.

And so we come to the conclusion that trenches are justified, necessary, and indispensable only in the zone of heavy fire—in the case of constant contact with the enemy, in the main line of resistance, and immediately behind it (Figure 3). Everywhere else, however, they do much more harm than good, are absolutely superfluous in coast defense with its only occasional, short periods of contact with the enemy, and constitute nothing but an unintentional aid for enemy reconnaissance.

The art of fortification is pursuing, unmistakably, a definite trend. From the high city walls and mighty fortifications, evolution led to low infantry works, then to infantry trenches in the earth, separated from one another in breadth and depth. But now not even disappearance in the earth suffices! Total concealment of the mass of the fortification from the eye of the flier, from the

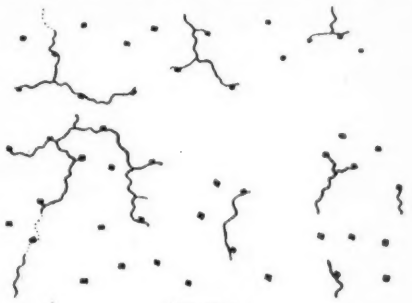

FIGURE 3.
POSITION WITH WEAPON EMPLACEMENTS AND FEW TRENCHES.

violence of the barrage and bombs, and from the storming onslaught of the tank attack is necessary and can be achieved by the skil-

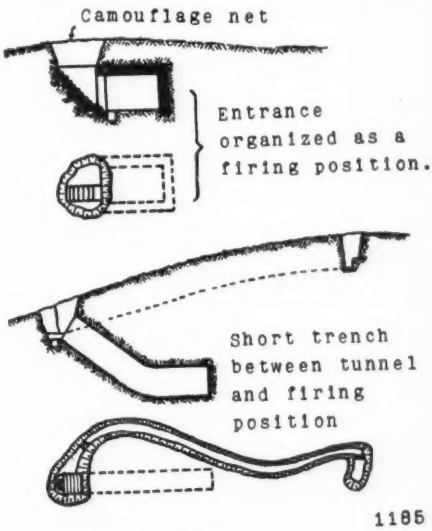

FIGURE 4.
WEAPON EMPLACEMENTS.

ful distribution and blending of the weapon emplacements and dugouts with the terrain (Figure 4), but never by a system of trenches.

To many an experienced officer the foregoing method of combat will appear unusual, and he will not have confidence in the control of his troops—especially because of the heavy mental strain to which it subjects the individual. He may have in mind that breaking up the main battle position into emplacements is only the well known preliminary and man-saving prelude to that condition of his position which arises at the high point of every modern artillery and tank battle and bomber attack and which, nevertheless, Germans have already gone through under the most difficult of conditions. And so this method of fighting is only a question of a resolute and correctly executed breaking away from old forms, only a question of education and training of the troops and of confidence in one's soldiers.

It is, however, no longer a question that is open to just any solution, for it is subject to the compelling law of inevitable evolution. Recent events have shown and will continue to show that the recognizable fortification and, therefore, the trench system of 1914-1915 have lost decisively in combat value, and that on this account the tactics of fortification must pursue new ways. Technical execution alone, without these tactical prerequisites, cannot create and secure defense fronts.

New Light on the Russian War

An article by "Basilicus" in *The Fighting Forces* (Great Britain) August 1944.

THERE is now gradually emerging from the smoke screen of propaganda and partial narrative on both sides, something of the truth about the Russo-German war in the East, and while it is not yet possible to draw up even now an accurate outline sketch of the actual course of events, or of the numbers engaged and the losses suffered by both sides, we are in a position to estimate some of the more influential factors, and dissipate some of the legends which have already collected round the war.

It is now clear, for instance, that when Hitler, or the German High Command (whichever it was), decided to launch the war against Soviet Russia, this course of action not only had much to be said for it but came perilously close to full success. The German Army was at that time, and remained for some months to come, superior to the Red Army in almost every respect; in some respects it probably still is, even today. Only in total numbers was it inferior in the summer of 1941, and even in these it was superior for the first few weeks of the campaign. Numerous though they were, the Russian tanks, vehicle for vehicle, were unable to stand up to the Panzers, and the Panzer divisions, the cream of the German Army, retained right up to 1943 their supremacy on the battlefield; from the technical, organizational, and equipment point of view, the Russian armored formations were much their inferiors and whenever the two met in equal battle, had decidedly the worst of it.

The Soviet Air Force was also less efficient technically than the Luftwaffe, many of its standard types being obsolescent, and this initial handicap was increased by the fact that in the first few days of the war, despite all warnings, the Russian squadrons allowed themselves to be caught on their airfields and suffered severely. In 1941 the Luftwaffe ruled the Eastern skies practically unchallenged, and right up to the summer of 1943 it could always secure local command of the air over its chosen battlefield.

The main mass of the Russian troops was, as always, brave, stubborn, hardy, and devoted to its duty, but it was not on the whole well armed, its training left something to be desired, and it was without war experience of any kind (only a small fraction of the Red Army had taken part in the wars in the Far East and in Finland).

The higher commands were over-weighted with veteran generals of Revolution and Civil War vintage, for the most part too old to learn the new ways of war. The potential strength of the Red Army was immense, and the population and natural resources of Russia practically inexhaustible; but there were good grounds for Hitler's belief that by a series of violent blows launched by surprise and pushed home with relentless vigor and speed, he could inflict crippling losses on the Red Army and overrun all the rich and populated regions of European Russia which form the main strength of the Soviet Union. And indeed he very nearly brought the business off; he did, in fact, succeed in achieving all three aims but he underestimated the political power and cohesion of the Soviet regime and the determination and recuperative powers of its people. It was this rather than any purely military miscalculation which in the end proved fatal to him. As it was, the Germans inflicted such severe losses on the Russians and occupied so much of Russian territory that, if any other European army or nation had suffered similarly, it would have had no army left to fight with and no territory left to fight in.

Hitler might perhaps have come even nearer to decisive victory than he actually did, had his plan of operations been more judicious and less grandiose. Among the alternative plans considered by him was one said to have been drawn up by General Marcks, formerly a member of the staff of General Schleicher, one of the victims of the purge of June 1934; his idea resembled a sort of Schlieffen plan in reverse, the main mass of attack being concentrated in Hungary and Rumania for a drive through the area between the Dnieper and the Black Sea, aimed at the Caucasus oilfields and the lower Volga. It was expected—as actually happened—that the Russians would keep the bulk of their best troops well to the west, in eastern Poland and the Baltic States, so that this offensive would envelop them, and a subsequent swing round northwards up the Volga would take Moscow in rear, mop up the rest of the Russian forces, and enable the Germans, in due course, to clear the whole country as far as the Urals. Hitler, however, probably for political as much as for military reasons, preferred the plan of a general attack all along the front, followed by three massive diverging drives in the direction of Leningrad, Moscow, and Kiev.

For this purpose the German Army in Russia was formed into three groups of armies—the northern under Leeb consisting of the 18th and 16th Armies; the center under Bock of the 9th and 4th Armies; and the southern under Rundstedt of the 6th and 17th Armies. These three held the front between the Baltic Sea and the Carpathian Mountains; in Rumania another mixed group under List, consisting of the Hungarian contingent, the 11th German Army, and the 3d Rumanian Army, was to drive across the Dniester into Bessarabia and the southwestern Ukraine. To these the Russians opposed three groups of armies: the northern, of five armies under Voroshilov; the western or central, of seven armies, under Timoshenko; and the southern, also of seven armies, under Budenny. (It may be noted in this connection that the Russian "army" was a much smaller formation than its German or British namesake, corresponding more or less to the German or British corps.) The initial Russian numerical inferiority was therefore considerable, and the German advance was rapid. The Panzers and the Luftwaffe quickly asserted and maintained their supremacy, and only the stubbornness of the Russian infantry, which, instead of retreating or surrendering as soon as their front was penetrated and broken up by the Panzers and the aircraft cooperating with them, hung on and fought to the end or broke back, prevented a complete collapse of the whole front. Even so, the Red Army suffered defeat after defeat, and the Germans made large hauls of prisoners and material of all sorts; probably in the first period of the fighting the Russian losses were in the neighborhood of a million men. Two of their group commanders were relieved, and Zhukov, the Rus-

sian Chief of Staff, was brought in on the central front to try to save Moscow. As the Germans advanced farther, their pace and impetus had diminished, and by using half-trained militia and other units as buffers to cushion the final hostile thrust, time was gained by the Russians to collect in the area of the capital just enough first-line troops to stop and turn them back from its gates. It was a close call indeed, just as it had been a few weeks earlier at Leningrad; and then, with both sides exhausted by their incessant and costly efforts, the Russian winter caught the Germans completely unprepared and brought them almost as near disaster as the Russians had been a few weeks before.

The German High Command, relying on swift and complete victory, had neglected to make any preparations for the winter, and the sufferings of the troops from want of suitable clothing and accommodation resulted in a heavy rate of mortality and pulmonary disease, and a sudden and widespread decline of morale which led many of the army chiefs, including Brauchitsch, the Chief of Staff, to the belief that only a retreat to a prepared winter defense line well in the rear could save the army from complete disintegration. According to German reports, Hitler set his face firmly against this, and the front then held was organized for defense as it stood. Powerful centers of resistance—the famous "hedgehogs"—munitioned and provisioned for prolonged all-round defense, even if cut off for long periods from outside supply, were erected at all strategic points, such as road and railway junctions; and though some of the more advanced of these were captured by the Russians, and the intervals between them were penetrated, and the wide area around and in the rear of them over-run by light forces of Soviet horse and ski troops, the main framework of the German front remained intact throughout the winter and spring of 1941-42. The German troops underwent a severe ordeal; their losses were heavy, but their shaken morale and fighting spirit recovered and by the summer of 1942 was as high as ever. Moreover, the Command had learned valuable lessons from its experiences of the previous year; new weapons were brought into service, and new tactical methods devised, and though the army was now no longer strong enough for an all-out general offensive on the whole front, it was fully equipped for a formidable attack on whatever sector should be selected for it.

The Russians, too, had learned much, and, in particular, that their armored and air forces must be drastically re-equipped from top to bottom if they were not to be again outclassed by the Panzers and the Luftwaffe. But though new tanks and aircraft, as good as any the Germans possessed, if not better, were designed and put under construction, the winter months were not sufficient for their massed production in the numbers required. The depleted and disorganized war industries suffered in output from the loss of the factories and raw material of the Ukraine, and the transfer of many of them beyond the Urals had also inevitably caused a time-lag. Allied aid, though already in full swing, was not sufficient to make good these deficiencies, so that the Red Army entered on the summer campaign of 1942 still noticeably inferior in many respects to its adversaries, and underwent a new and even more disastrous series of defeats.

For this campaign Hitler had resorted to a revised edition of the Marcks plan, and decided to launch a powerful drive in the area of the Donetz and the lower Don, with the object of rupturing the front of Timoshenko's southern group of armies, throwing it back upon the lower Volga. From there the Germans could either swing north so as to cut off Moscow and envelop the whole of the central Russian front, or turn south against the Caucasus to seize the valuable oil fields there. The opening of this great operation was delayed until July, firstly by the necessity of capturing Sevastopol, which proved a longer and more expensive business than had been expected, and then by a preventive offensive launched by Timoshenko in the Kharkov sector which, however, cost the Russians more in losses than it was stra-

tegically worth. The German blow, when it actually came, had the force and velocity of a thunderbolt; the Russian front was completely shattered, and a furious whirlwind pursuit carried the Germans across the Don to the border of the Volga and Stalingrad, and over the Kuban Steppes to the Caucasus foothills.

At this moment the Red Army was perilously near collapse; its casualties had been crippling, its organization had been severely strained, and, above all, there had manifested itself a grave weakness in the command which only the most drastic measures could remedy. There were still, in high place, too many elderly generals steeped in Civil War traditions, impervious to new ideas and temperamentally incapable of swift reactions in a crisis—contemptuous of and deaf to the counsels of younger men with up-to-date ideas, whose path of advancement they grudgingly and wilfully obstructed. Stalin in person took the situation in hand, as he had done in a similar crisis twenty-three years before at Tsaritsyn. He issued a scathing Army order, saying that the abandonment of Rostov and Novocherkassk had "disgraced the Red Army's banners; that the abandoned population were losing faith in it and cursing it because it delivered them to the yoke of the German oppressor." Now the watchword must be: "Not a step backwards." "We lack order and discipline in the units; we can no longer tolerate commanders and commissars who abandon their posts at will; they will be considered as traitors and treated accordingly. All such who allow their troops to abandon their positions without orders shall be brought to trial by court-martial, and special penal units shall be formed from those who betray their trust and sent to serve on particularly dangerous sectors of the front."

His actions were as ruthless as his words. There ensued a thoroughgoing purge, in which dozens of commanders of all ranks, from the highest to the lowest, were removed and replaced, many of them being brought to trial and severely dealt with. A new spirit was breathed into the Army, and at Stalingrad and on the slopes of the central Caucasus the German thrust was stayed. The rally came only just in time to save Russia from a crushing disaster, which, if it had not forced her out of the war altogether, would have completely crippled her as an effective member of the Alliance for many months to come. As it was, the German Army had overreached itself, and now, brought to a stand on an enormously long and strategically weak front, which its reduced numbers only allowed it to hold thinly and in important parts with unreliable satellite troops, it lay wide open to a counteroffensive. The result was the destruction of the 6th Army at Stalingrad and a hurried retreat from the Caucasus, and the close of the campaigning season of 1942 saw the Germans back almost in the positions from which they had started in July, badly stricken in morale and weakened by severe casualties which, in their shortage of manpower, they could never replace, while the Red Army, after rallying on the edge of the precipice of disaster, had established an ascendancy which was to increase from now on.

Yet the enemy was still formidable, as he showed following on the repulse, after a first promising success, of his powerful converging offensive against the Kursk salient. A skilful defense, in great depth, cushioned and engulfed the massive thrusts of the Panzers, and the Russian armor then struck at the northern flank of the Orel salient, and made a good advance until it met a Panzer counterthrust. Division for division, the Panzer formations, with their wealth of technical equipment far ahead of anything the Russian units yet had, their skilful leadership, fine skill, and unrivalled experience, were more than a match for their foes and stopped them dead. The Orel salient had to be eliminated and captured in costly infantry frontal attacks, but the Red Army had the men to lose, and the Germans suffered more lightly in numbers but more severely in proportion to their waning strength. Once again at Kharkov the Russians tried the expedient of a massed armored attack, but with no more success than before. Henceforward,

they pursued the strategy of rapidly alternating thrusts at widely separated points, exploiting each as far as it could economically be pushed, and shifting the sector of attack as soon as the hostile armored reserves appeared on the scene. They themselves had by now sufficient density of troops all along the line to be able to pursue this policy without having to shift reserves for each attack, which, with the paucity and poorness of their lateral communications, would have been difficult. Moreover, the open character of the fighting—for, on such an enormous front, anything like a continuous line was impossible, and even with the large numbers on either side there were everywhere opportunities for infiltration and maneuver between the widely spaced centers of resistance—gave them numberless opportunities for applying these methods, and the German reserves, rushed hither and thither to plug one hole after another, became gradually depleted. So slowly, sector by sector, the battlefront ebbed westwards, and the strain on the Germans was shown here and there by local collapses of resistance, such as occurred in the Melitopol area and at Smolensk before the close of 1943, and again on the Dniester in the early part of this year. The unusual mildness of the winter and the skill of the Red Army in solving the problem of carrying on the offensive without any prolonged pause right through until the spring thaws came to enforce a halt, added to the enemy's difficulties. By the spring of 1944 he retained only a few strips of Russian territory on the northern and central fronts, and the Red Army had thrust in many places deeply across the Polish and Rumanian frontiers. As these lines are being written, the Russians are now gathering with tremendous vigor and skill the fruits of their first victory of the summer of 1944 against the long impregnable central sector of the hostile front in the Dnieper-Dvina gap, and the decisive campaign of the long and bitterly fought war in the east is in full train, with final German defeat inevitable.

Out of such tribulations into such triumph has the strategic genius of Shaposhnikov and Vasiliev, the two chiefs of staff responsible for the general conduct of the war, the fine leadership of the marshals and their subordinates, Zhukov, Timoshenko, Vatutin, Konev, Rokossovsky, Govorov, Popov—to mention only a few of the more prominent—and the skill, valor, endurance, and zeal of the fighting officers and men, brought the Red Army today. To affirm, in defiance of probabilities and known facts, that all from the first and throughout went well with it, that its defects were only cunning traps for the foe, and that it had needed no lessons from disaster and no agonizing and unexpected crises or troubles to meet and overcome, is to distort and undervalue its real achievement and deprive it of its true glory. The Russians made almost ruinous initial errors, but they were able to repair them; more than once they were brought to the brink of catastrophe, but they clung on and fought back, and, in the end, learned and applied the secrets of final victory. History owes it to them to realize the true facts of their achievement, for only so can the measure of its greatness be worthily assessed.

Infantry Battle Formations

Translated at the Command and General Staff School from a Russian article by Major B. Korolev in *Krasnaya Zvezda* (Red Star) 13 September 1944.

ANY battle formation should contain a definite tactical idea and bear the imprint of the commander's plan. A sound plan, carefully worked out and intended for the precise execution of the assigned mission in the given situation, is reflected, as a rule, in the battle formation. But when the decision is vague and the plan of battle is not well adapted to the assigned mission, the battle formation will be accidental or stereotyped; it will not conform to the situation, and will hardly lend itself to changes which the situation may re-

quire. An experienced officer observing a battle formation of a large or small unit of another officer will be able to determine immediately the tactical idea of the latter and whether or not it is correct and well worked out.

Battle experience shows that our officers are masters of tactical planning. They employ a variety of battle formations, combine them, and shift from one formation to another to conform to changes in the situation.

The following is an instructive example of the rebuilding of the formations in the course of battle when this is required by the situation and particularly by the terrain. The regiment of Major Karas was to attack strong defensive positions in the vicinity of two lakes. The area between the two lakes was blocked by a powerful enemy strongpoint located on a commanding hill. Directly in front of the hill and between the hill and the shores of the lakes there were trenches forming a fortified zone several kilometers deep.

Considering the character of the German defenses and their location, the Major decided upon the battle formations beforehand and divided the operation into three stages. During the first stage—assault of the forward edge of the defense—the regiment operated on a comparatively wide front. The terrain in front of the hill was open. It allowed of dispersing the battalions along the front and, at the same time, of employing the maximum number of heavy weapons. The battalions attacked in a formation echeloned to the left rear and with intervals greater than usual. This formation fully justified itself. The regiment succeeded in breaking through the first position of the main defensive zone.

Then, when the regiment had reached the narrowest point between the hill and the lake, it advanced in three echelons—one strictly in the rear of the other. This battle formation, intended for the second stage, also proved fully justified. Any other formation, such as two echelons or, still worse, a linear one, would have resulted in excessive crowding of the infantry. But the main reason for this decision was the fact that the enemy had several trench lines in his second position. Under these circumstances, the three-echelon formation was best since it possessed a great breaching power.

During the last stage, after the regiment had gone around the hill and had reached its other side, it advanced in a single echelon (battalions in line). This was correct too, inasmuch as the regiment was beyond the second position and ready to assault the third position which, according to the reconnaissance data, was not very deep. While going around the hill the regiment was actually operating in a fire corridor, and the breakthrough was made possible primarily because of the powerful artillery support. Several artillery regiments fired on the hill, thus preventing possible enemy counterattacks.

When our units making the main effort advance in one continuous formation, flank to flank, the basic idea in the accomplishment of the breakthrough is a straightforward movement in most cases. The troops occupy first, second, and subsequent lines of trenches without any turning maneuvers. All the echelons are aimed straight forward in order to overcome the tactical depth of the main defensive zone. Under such conditions regimental units are not used for diversion. In some cases, however—and this depends upon the nature of the enemy positions and upon the fire plan—diversionary fires and attacks are justifiable. Major Karas employs diversion particularly against enemy weapons conducting protective line fire. This determines the type of battle formation to be used. Here is an example.

When assaulting a hill the battalions were echeloned to the left rear. The 1st Battalion started out first. It was given the mission of diverting the attention of the enemy by attacking his most important defensive area, which consisted of a timber and earth emplacement and a group of machine guns placed on open platforms and conducting flanking fire on a hollow on the left side. Through this hollow the regiment intended to deliver the main attack.

Having drawn the attention of the enemy

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toward our right flank, the Major attacked with his left flank: i.e., with two battalions echeloned to the left rear. They broke through three lines of trenches and came out in the rear of the defensive area which was being attacked by our neighbor on the left. Most of the organic weapons as well as the reinforcing weapons supported the 1st Battalion, and this was the main point in the idea of the diversionary blow.

Not without interest is the battle formation of a regiment in pursuit when it approaches an enemy deployed in successive positions. In this case the column of the main force should contain the rudiments of the formation which will be most advantageous for the attack of this successive position. This means that each battalion in the column of the main force should have with it all the organic and attached weapons assigned to it for the impending attack. The same applies to the companies within the battalions.

That is precisely the way Major Karas's regiment was formed after it had been ordered to overcome a German rearguard and to approach and attack a successive position. The plan of attack was worked out while marching. The battalions were given respective missions and knew in advance their place in the attack. The battalions approached the position and proceeded immediately toward the assigned areas of departure, while the direct support artillery group occupied firing positions assigned in advance. This precise and rapid reorganization made it possible, immediately after reaching the successive position, to get better organized and to establish observation posts, communication, etc. These preparations took only forty minutes, and a short artillery preparation was then followed by the attack.

The number of attacking echelons, the distribution of fire weapons among the echelons, and their location within the echelons—all this depends upon the situation and the plan of the commander. Here, besides knowledge, one should have that peculiar tactical sense which is acquired only through practical experience and which reflects the ability and talent of the commander.

The problem of locating the fire means is particularly difficult. Our infantry is supplied with heavy weapons, the distribution and placement of which in company and battalion formations is the cornerstone of breakthrough tactics. And this is directly tied with the building of battle formations of large and small infantry units.

Major Karas's regiment, as shown in the foregoing example, fought under a variety of conditions. In breaking through German defenses, his formations consisted of one, two, and three echelons. However, in attacking positions with continuous trenches his preference is a three-echelon formation. Such a formation is used when the plan of attack calls for a straightforward movement into the depth of the defensive zone in order to capture the trenches of the first, second, and third positions. Besides, he uses this formation for the exploitation of success toward either one of the flanks.

Much attention should be given to the distribution of the regimental artillery and to the location of battalion weapons in the initial attack. A skilful location of these weapons enables the regiment to deliver a fairly effective fire in attack, which supplements the fire power of the direct support artillery. In one of the attacks, the regimental artillery guns were distributed as follows: The first echelon (battalion) had only two 45-mm guns —one on each flank. This was motivated by the fact that the first line of trenches is subjected to a devastating fire during the artillery preparation. The second echelon had six guns, four of which were moving somewhat ahead of the infantry, in the intervals between the companies and on the flanks of the battle formation. These guns were intended for support of their own battalion and for support of the attack of the first echelon. Because of the wide front of the attack, the artillery fired not only from the flanks but also through the gaps between the companies operating ahead of it. However, the increased number of guns in the second echelon was motivated, first of all, by enemy resistance expected in the depth of the defense.

Finally, two 76-mm gun platoons moving

with the third echelon were to take care of the machine-gun nests which prevented the first and second echelons from attacking. Thus the artillery, moving along with all the echelons, could give support at any time to those units which needed it most.

In this case, Major Karas did not deem it necessary to group his machine guns. They moved by platoons in the intervals between the rifle companies. Otherwise, he often formed strong machine-gun groups which operated on one of the flanks of the attacking battalion.

In the example described above, the companies used linear formation. The depth of the battle formation in each battalion was essentially determined by two lines: one consisted of companies, and the other, of machine-gun, mortar, and close-support artillery units. The first line consisted of manpower; the second, of heavy weapons. In attacks with an open flank the heavy weapon line was covered by artillery, mortars, and machine guns.

Battle formations belong to that field of military art where triteness cannot be tolerated. Combat missions and situations are extremely varied. Not infrequently, having begun an attack under certain conditions, the troops continue it under quite different conditions. This is especially true of the battles of maneuver developing after a successful breakthrough of positional defenses. Battle formations, therefore, should be varied and flexible. The principles involved here are always the same, but in their application the officers are given wide opportunities for exercising their creative initiative.

British Flame Throwers

From an article in *The Times Weekly Edition* (London) 30 August 1944.

AMONG the newest assault weapons of the British Army, the Lifebuoy, the Wasp, and the Crocodile—all flame throwers greatly superior to their German counterparts in range, ferocity, and technical features—are names to be reckoned with. The Churchill Crocodile, fitted to the heavily armored tank of that name, is the most powerful and most devastating flame thrower in existence anywhere.

After a demonstration under operational conditions in the Southern Command, it is possible to describe the salient features and performances of these hitherto very secret weapons, which after literally burning and blasting their way through Hitler's Atlantic Wall—this was their first trial of strength against the enemy—have since saved the lives of countless attacking British and Canadian infantry in Normandy by subduing and terrorizing the enemy in his trenches and strongpoints with gun and flame. That was the specific purpose for which they were created.

Deriving its name from its appearance, the Lifebuoy (Figure 1), borne on the back

FIGURE 1.

THE "LIFEBUOY," A FLAME THROWER USED BY PARATROOPS, COMMANDOS, AND INFANTRY, WHICH PROJECTS ITS FLAME TO A DISTANCE OF FIFTY YARDS. (FROM "THE ILLUSTRATED LONDON NEWS.")

of a man, consists of a ring-shaped tube for carrying the fuel, with another spherical container for compressed gas. The flame, with a range of about fifty yards, is pro-

jected from a "gun" in which is incorporated an igniting mechanism. It has been used with conspicuous success by paratroops, commandos, and Canadian infantry. And the demonstration, at which supporting fire was given by small arms, clearly proved that it can be employed with deadly effect in dislodging Japanese troops from the bunker-type pillboxes which they had considered impregnable against infantry assaults.

More spectacular and much more terrorizing is the Wasp, which, fitted to a standard

FIGURE 2.

AN ARMORED FUEL TRAILER DRAWN BY A BRITISH CHURCHILL FLAME-THROWING TANK. (FROM "THE ILLUSTRATED LONDON NEWS.")

carrier, operates in situations calling for a larger fuel supply and greater mobility. The tanks containing the liquid fuel and compressed gas are easily accommodated on the carrier, and the "flame gun" projects through the front armor. Because of the bullet-proof body of the carrier, the Wasp, which like the Crocodile belches great tongues of flame over a distance of more than 150 yards, can be brought forward under fire to attack enemy strongpoints and positions. Another advantage is that the fuel tanks can readily be mounted on or taken out of the carrier in the field, in the latter case immediately freeing the vehicle for normal use.

The Crocodile, fitted to the Churchill tank, is the giant among the newcomers—in flame power as well as in destructive effect. In this case the fuel, fed through an armored pipe, is carried in an armored trailer towed by the tank (Figure 2), the trailer being universally articulated so that it can move in any direction. By an ingenious device the trailer can be jettisoned if the need for this arises, and the tank then reverts to its normal role, since the flame-throwing apparatus does not interfere with its existing armament. The trailer is controlled from inside the tank.

A feature of the special fuel used by all three of the new assault weapons is that it enables the flame gun to be fired round corners, as the fuel will ricochet and produce fierce and persistent fire in the nooks and crannies of pillboxes and trenches.

The Crocodiles were needed thirty-five minutes after the landing in Normandy, and they were ready. They led the Second Army in the advance to Crepon, and since have taken part in almost every operation and fought with every British and Canadian formation in the bridgehead. In an action typical of many, two troops of Crocodiles were detailed to support a Scottish regiment in an attack on an enemy position north of Esquay. The enemy, strongly entrenched in the front edges of woods and along hedgerows, were very difficult to dislodge. One troop of Crocodiles on either side of the road, each followed by a platoon of infantry, with a section detailed to keep right up with the flame tanks, went in at dusk. As the Crocodiles flamed the hedgerows the enemy broke from them and ran. Those who stayed were burned; those who ran, killed by the infantry. The objective was gained without the infantry losing a single man, and subsequent interrogation of prisoners testified to the devastating and demoralizing effect of the flame attack.

In war nothing is won except by calculation.
—Napoleon

The Arnheim Victory—A German Account

Translated at the Command and General Staff School from a German article by War Reporter Kurt Pauli in *Deutsche Allgemeine Zeitung* 1 October 1944.

At the time of writing of this article, the action around the Nijmegen-Arnheim [or Arnhem] sector was still confused and somewhat unsettled; later, strong ground forces moved up from the south and established contact with airborne forces in the area. Together, they then attacked German positions opposed to their path of advance and have been slowly driving the enemy back toward Germany ever since. All of the vital bridges across the various rivers mentioned are, and have been for some time, in our hands.

In connection with the German claim that some 5,000 British A/B troops surrendered to them in Arnheim shortly after the landing, such a claim can be completely refuted. While British casualties were high because of the type of action involved, at no time did any sizeable force lay down its arms. They preferred to fight when all hope was gone rather than to surrender.—THE EDITOR.

IN the Wehrmacht communiqué of 27 September it was reported: "In the Arnheim sector on 26 September the last resistance of the surrounded 1st English Airborne Division was broken. The rapidly assembled forces representing all arms of the Wehrmacht, under the command of the Commanding General of a Schutzstaffel Armored Corps, General Bittrich, Group Commander, succeeded in ten days of bitter fighting in completely wiping out an English Elite Division in spite of the most stubborn defense and reinforcement by means of additional landings."

The mission of the 1st English Airborne Division, which has been entirely wiped out in the Arnheim area, was to seize possession of the two bridges over the Old Rhine at Arnheim and to hold them till contact was established with Nijmegen. In this operation, the ambitious operational objective of the Anglo-American troop command was to forge the other jaw of the pincers in the Holland area, the first half of which was applied at Aachen, in order to break the Rhenish-Westphalian industrial region of the Reich. The whole plan hinged on the possession of Arnheim and its bridges. After ten days of fighting, Arnheim is again cleared of the enemy, down to the last Englishman. The Dutch populace, which had fled to the suburbs during the street fighting, is already beginning to return to the city.

The Anglo-American command had chosen 17 September, a Sunday, for the beginning of the airlanding operation. On this bright, sunshiny day, thousands of soldiers leaped from their planes and landed—English, Americans, and Poles—at Eindhoven, Nijmegen, and Arnheim. The main body of the Americans landed at Nijmegen; the English, at Arnheim. At the same time, the London radio called on the Dutch population to rise against the Germans. The Dutch, however, preferred, as a sign of their neutrality, to paint their air-raid helmets white.

When, on 17 September, the two and four-motored planes, with paratroops in their bodies and gliders in tow, reached their objective, the German antiaircraft artillery positions had already been bombed hours previously in an area bombing operation. The operation at Arnheim seemed particularly to promise success, for it was the strategic key point, and north of the Old Rhine in the Velüwe—the area west of the city—about a thousand gliders landed with an entire English airborne division. Most of the soldiers and officers of this division had already fought in Africa and Italy. Many wore decorations for bravery. The division brought to Arnheim not only heavy infantry weapons such as mortars and heavy machine guns but also motor vehicles, antitank guns, small caliber guns, and means for close combat with tanks, and in such great amounts that they did not have to be sparing of ammunition at all.

In such air attacks, the attacker always has the element of surprise on his side, and an English assault unit succeeded in Arnheim. In the first hour, moving from the north upstream along the Old Rhine, it seized possession of the only two Rhine bridges.

This was the situation when on the afternoon of 17 September German countermeasures got under way. The London radio had already loudly proclaimed the first successes. On the German side every German unit in the area—Elite Guard troops, army, naval forces, air forces, and National Labor forces, all were assembled and placed under the commander of the "Hohenstauffen" Elite Guard Armored Division. The commander formed two combat groups and immediately engaged the enemy. Tiger and Panther tanks, assault guns, and antiaircraft and antitank guns on self-propelled mounts rolled toward their objective. The first combat group drove on through Arnheim westward to the area where the enemy had landed and established contact with him on the evening of the 17th. The combat group commander drew a curtain around the area occupied by the enemy west of Arnheim, felt the enemy out, covered him with an unending stream of shells, and drew the curtain tighter and tighter and closer and closer. By the fourth day, thousands of the English were squeezed together in such a narrow area in the suburb of Oosbeek that the task of dropping rations from the English planes soon became as difficult as that of trying to score a hit in the bull's-eye. Captives later asserted that without the provisions found in the cellars of Oosbeek they would have been obliged to capitulate much sooner. After the combat group had then succeeded in pushing the Oosbeek *Kessel* [encirclement] back from the Rhine and in dividing it up, the men—some 5,000 of them—laid down their arms.

The second combat group, on 17 September, was ordered to recapture the bridges over the Rhine and immediately afterwards to push on to Nijmegen and hold the enemy back till the last of them in Arnheim had been annihilated.

When this combat group, closing in from the northeast, had reached a point near the street leading onto the bridge in the night of 17-18 September, it ran into a heavy fire from snipers in the houses to the right and left of the street leading to the bridge and was pinned down at first. The English were even firing from the tower of the red church. All the houses in the vicinity of the bridge had been organized into a system of fortifications. As was learned later from prisoners, they had even brought their own material for this purpose from England.

The commander, who had come from the armored arm, put Tiger tanks to work attacking the houses one after the other. After two of the tanks had been set on fire while engaged in this task, he decided to give the enemy the choice of surrender or annihilation. The English chose death. The whole of the quarters in the vicinity of the bridge went up in flames—and this is the only damage that was done in Arnheim itself. The bridge was again in our hands. This happened at a time when the other combat group was still engaged in bitter fighting with the English encircled in Oosbeek.

The commander immediately turned his attention to the enemy who had landed at Nijmegen. They had succeeded there in getting across the Waal, down stream from the two bridges, and in gaining possession of the latter in a surprise attack. It was now necessary to hold the enemy back until the English in the Arnheim area had been wiped out.

The combat group met the enemy on the north bank of the Waal in the vicinity of the main highway which connects Nijmegen with Arnheim. Heavy fighting took place in which the enemy was forced to retreat westward. But since the airborne forces at Nijmegen had orders to relieve the hard pressed English at Arnheim regardless of cost, the enemy at Nijmegen immediately pushed northward again. The combat group outflanked and attacked the enemy and set five of his Sherman tanks on fire. As a result no land contact was established between Arnheim and Nijmegen.

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Use of Mines in Offensive Operations

Translated at the Command and General Staff School from a Russian article by Lieutenant Colonel V. Kharchenko in *Krasnaya Zvezda* (Red Star) 26 February 1944.

MINES are one of the effective means of destroying enemy matériel and manpower. Mines can not only block the way for German tanks when in defense, but also repel their counterattacks during offensive operations. Mine-laying sappers manage to cover quickly a flank which has become exposed during the course of a battle, secure the defense of a captured terrain feature, and close a gap between our battle formations. Battle experience is rich in examples of successful use of antitank and antipersonnel mines. The distinctive feature of mines as a means of combating enemy matériel and manpower is that any area the sappers manage to penetrate can be rapidly mined.

Mines can be easily transferred from one sector to another, forming a sort of movable obstacle. Many cases are known when the transfer of mines from one terrain line to another protected the flanks of our advancing units or covered their junctions. Having laid mines in the threatened direction, the sappers often transfer them into new places, coordinating the disposition of minefields with the advance of our troops and with the general situation in the given sector. The establishment of mine obstacles became a habit with many of our units. Considerable experience in laying minefields in offensive operations has been acquired by the guardsmen of our unit.

Wherever it was impossible to lay permanent minefields because of the terrain or the necessity of economical expenditure of mines, the "X" Red Banner Guards Division used mobile sapper detachments. Usually, only controlled mines were laid in advance. Other minefields were laid during the course of the battle. The sappers of the unit were experienced in using mines and did it skilfully. This method of laying mines is much more advantageous than permanent minefields. Each mine is laid only where it is actually necessary and this is the advantage of the method. Its successful application depends on the preliminary training of the sappers and the rapidity of their action. Let us discuss now in detail the activities of the sappers of the "X" Red Banner Guards Division. The sappers of this unit have acquired such a skill in laying minefields that they can do it literally under the very noses of the German tanks. This is the result of a series of measures taken in advance. First of all, the sappers study the terrain at every favorable opportunity. Then each threatened direction or route where counterattacking enemy tanks are expected to appear is assigned to definite sapper units.

For actual mine laying these units detail mobile mine-laying groups. Each group is given one or two sectors for laying minefields. But the mines are not laid unless it is certain that German tanks are moving in this direction. Mines are then laid on their battle course, and this method has proved to be very effective. Hardly a single mine is wasted, and on each minefield the Germans suffer losses in matériel. It is curious that, having run onto newly laid mines, German tanks usually change their direction looking for passages in the minefield. But the new route also has newly scattered mines. The German tank crews get the impression that they have gotten into an endless minefield. All they can do then is to return to their departure areas. Otherwise they are inevitably blown up by the mines.

It should be noted that all the operations of the sappers must be closely coordinated with the general tactical situation in the attack zone of the unit. In all sectors where minefields are planned, the sappers and the artillerymen should iron out all questions of cooperation between each other.

The entire personnel of the "X" Guards Division has become familiarized with this method of laying minefields in battle, which is now successfully applied during all phases

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of the attack. The sappers move forward with the other units, and their place in the battle formation depends on the development of the battle. During a breakthrough of the forward edge of enemy defenses, the mobile sapper detachment moves along the open flank of the unit. When the purpose of the battle is to overcome an enemy defensive zone, the sapper detachment frequently moves in the center of the battle formation. When the unit moves forward successfully and fights in the depth of the enemy disposition, the sappers move with the antitank reserve. The action of the mobile sapper detachment is determined in each case by the situation in which the attack develops.

The sappers conduct reconnaissance ahead of their infantry units. Thus, during a breakthrough of one of the sectors of the enemy defenses, the sapper detachment, operating on the right flank of the unit, determined by reconnaissance that the enemy had concentrated up to thirty tanks and an infantry regiment for a counterattack against this flank of our unit. So upon moving forward toward the expected enemy blow, the sappers, in cooperation with the adjacent infantry regiment, determined on the ground several probable directions of the impending enemy attacks. Armed with mines, they swiftly moved ahead of the infantry units. Soon the enemy launched a counterattack. Twelve tanks were moving in the first echelon of the counterattacking forces. Mine obstacles skilfully laid in small groups (from fifteen to twenty-five mines in each) determined at once the outcome of the battle. Three enemy tanks were blown up by the mines. The other tanks stopped and were partially destroyed by our artillery. The remaining machines returned to their position of departure. The counterattack was repelled. In addition to the mine obstacles laid along the battle courses of enemy tanks, the sappers also laid small clumps of mines to cover the positions of our artillery and mortars.

And here is another episode from the experience of our unit. During an attack, and particularly during the breakthrough of the main zone of defense, the enemy made desperate efforts to retain his positions. The commander of the unit was forced, without inflicting a frontal blow, to maneuver with his forces looking for a weak spot in the enemy defenses. During this time the sapper detachment operated in auxiliary directions, laying minefields to protect the open flanks and transferring mine obstacles depending on the movements of our units. The battle lasted several days. During one of these days, the sappers, acting according to the situation and the maneuver of the troops, had to lay minefields six times and to transfer them along the front or into the depth; and each time, the enemy suffered losses both in men and matériel. The fact that the flanks of the unit were protected by mine obstacles enabled the commander to concentrate his main forces in the proper area for a decisive blow.

The operations of the detachment proved particularly effective during the battles for the bridgeheads on the right bank of the Dnieper. The sappers, moving within the infantry battle formations, ferried their mines to the other bank using all sorts of crossing materials available locally, and immediately started mining the bridgeheads. For example, the rapid capture by our troops of an important bridgehead on the right bank of the Dnieper and Pripyat was met by the counterattacks of large tank and infantry units of the enemy. The Germans attempted, at any cost, to throw into the Dnieper and destroy our troops which had already crossed the river. Our mobile sapper detachments scattered mines literally in sight of the counterattacking German tanks, thus barring for them all routes of advance. The terrain contributed to this action. Deep sand, forests, and marshy sectors compelled the enemy to move mainly along roads and clearings, which were quickly blocked by mines, making the area absolutely inaccessible to the enemy.

Skilfully laid mine obstacles blasted thirty-one enemy tanks, (among them four tanks of the "Tiger" type), one self-propelled gun, and three armored cars. In the course of the battle, the sappers were more than once involved not only in fire fights but also in

hand-to-hand fighting with the enemy infantry. As the Dnieper bridgehead grew and extended, the minefields were moved almost every day and sometimes even several times a day. Every move of the troops was followed by the sappers.

Thus, successful operations of the mobile sapper detachments depend on the following factors. They should be based on continuous reconnaissance data. Sappers should be kept in constant readiness and stationed in each threatened sector. The success of their operations depends upon the rapid and unexpected laying of minefields. Moreover, each minefield, its location, and the arrangement of mines should be coordinated with the artillery fires of the adjacent batteries and guns. The personnel of the detachment should be thoroughly trained for special missions and for battles in which many arms participate. Having these qualities, the sappers are likely to play a very important part in combating German tanks and in securing for our troops a planned and more rapid development of the attack.

Desert "Hooks"—Outflanking Movements in Desert Warfare

Digested at the Command and General Staff School from an article entitled "The 2d New Zealand Expeditionary Force in the Middle East," by Lieutenant General Sir B. Freyberg in *The Army Quarterly* (Great Britain) October 1944.

THOSE who had studied the possibilities in North Africa realized that the waterless wastes of the Western Desert would no longer be a comfortable and wide barrier, proof against an invasion of Egypt by a modern motorized army. It was clear to all that the great open spaces of the Western Desert were ideal for mobile warfare.

From the beginning of the war the aim of the New Zealand Force has always been to become as mobile as possible and to increase its offensive power. Through our mobility and our hitting power, the New Zealand Division with British armored formations under command was largely instrumental in turning the enemy out of two of his "impregnable" positions, El Agheila and the Mareth Line.

Our organization as a motorized division should be explained to avoid confusion in terms. The division was a combination of the infantry division and the armored division, an infantry division less one infantry brigade replaced by an armored brigade. It retained a divisional cavalry regiment and the machine-gun battalion. The whole force was completely lorry-borne. The infantry brigades must not be confused with motor brigades; they were trained and equipped as ordinary infantry, capable of carrying out all the normal roles of infantry in both attack and defense.

The outflanking move in the desert, or the "hook" as it has been aptly called, was not a hit or miss operation but was always most carefully planned. The force had to travel self-contained for long distances, both by day and night, usually over unknown country. The planning of the axis of advance or thrust line depended on reconnaissance by men who understood the peculiar mobility of our force. They had to be able to judge whether it was practicable to move across the various surfaces at night, what speed could be maintained, and on what vehicle frontage the force could move. This preliminary reconnaissance was vital and all sources of information were used, including both long-range patrolling and air photography, so that the maximum amount of information on the going was available. Building up the "going map" takes months of work. Reconnaissance had to be carefully carried out, as surprise depended upon secrecy as well as speed. Much depended on the surprise we gained. The air situation was a big factor,

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for air superiority enabled daylight moves to be made in the early stages of an approach march.

As a turning movement is part of an army plan, the actual planning of the approach march depends upon the main set-up of the battle. D-day was usually fixed as the day when the main army attack is launched; generally a night attack. The outflanking movement was usually timed to strike home on the following morning. Assembly areas were selected as far to the rear as possible. As we could move long distances, this presented no difficulty to the wheeled transport, but it entailed extra mileage, and to enable echelons to cross with maximum petrol, oil, and water supplies, a Field Maintenance Center was established as far forward as possible.

In planning, the picking of the objective of an outflanking movement is of vital importance. The object of the hook must be clear in the mind of the commander. The whole intelligence picture must be studied and all enemy dispositions, especially those of hostile mobile forces, must be carefully studied. The principle we followed was to pick and occupy a position which would embarrass the enemy to the highest degree and force him to react and attack with inadequate preparation; if possible, unsupported by his artillery. The aim of the flanking operation was to deploy so as to separate the enemy tanks from their antitank gun line, force the enemy field guns off their survey, and if possible close the back door of the enemy position.

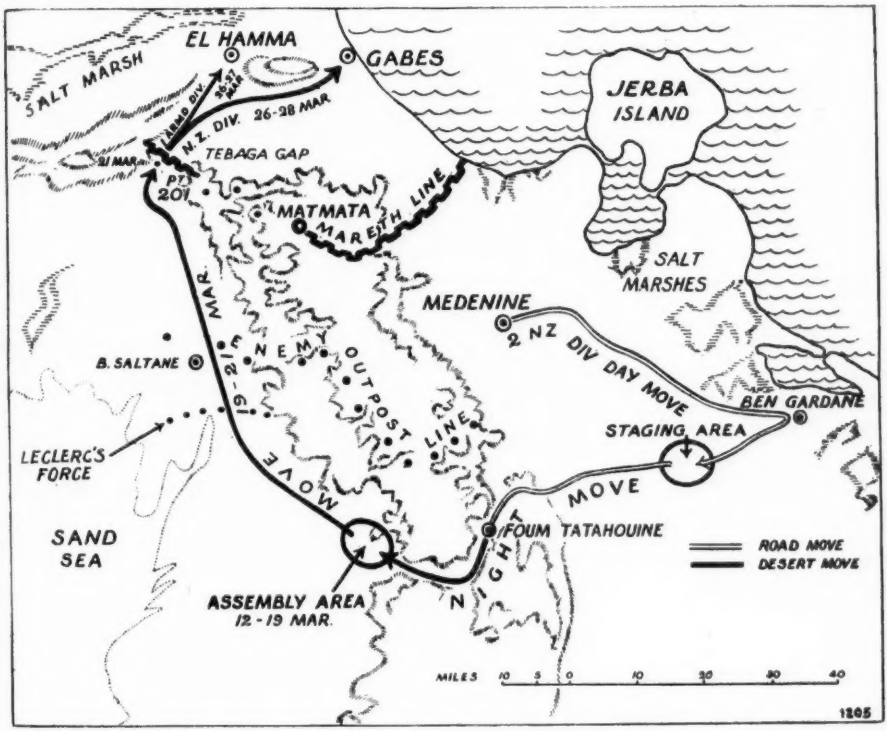
A useful analogy in discussing these turning movements is to think of the enemy's main position as a pillbox with side windows and a back door. If you threaten the defenders of a pillbox by putting an aimed shot into the side windows you will disconcert them, but the aimed shot into the back door throws them into a state of panic. The aim of the left hook was to threaten the back door, but the power to close that door depended upon the degree of surprise gained and the strength in guns and armor of the enemy mobile reserve compared with that of the outflanking force. Surprise was of first importance. Every effort to effect surprise was made. Wireless silence was essential during the whole move.

In a hook aimed at the back door, all areas in which opposition was likely to be met were avoided. The force struck deep behind the enemy position. One result of this was that our own lines of communication were abandoned. We lived on our "hump." This presented a difficult administrative problem which was met by being completely self-contained.

Undoubtedly, the largest force possible should take part in a hook. One limiting factor is the ground, or rather the "going." We found from our experience in the advance on Tripoli that over bad going it is unsatisfactory to attempt to move on more than one thrust line. The going determines the number of thrust lines, and more often than not there is only one which is suitable. A second factor is control. The ordinary corps headquarters has a vast organization which must travel in rear. In a flanking movement the commander must be at the head of the force. We found that the outflanking force should be the largest that could be quickly deployed and properly controlled by one commander. I consider the ideal outflanking force would consist of two armored car regiments, two armored brigades, two lorry-borne infantry brigade groups, two medium artillery regiments, and a slightly increased divisional staff. This force would comprise between 6,000 and 7,000 tanks, guns, and vehicles, and 30,000 men. With careful planning it should be capable of doing a turning movement of 250 miles, and of fighting two battles behind the enemy position.

Wherever possible, our outflanking moves were carried out in open formation on as wide a front as possible, with vehicles dispersed to between fifty and 150 yards, depending on the danger of enemy air attack. At night the column closed in—both laterally and from front to rear—to visibility distance, usually about ten yards interval. The force moved on an axis of advance which was

marked by a visible sign (a picket surmounted by a black diamond) and at night the route was lit with shaded lamps. These were put up about every 700 yards. We carried sufficient signs for 100 miles and lights for fifty miles. The axis was laid by the Provost on a line of advance settled by a navigator moving in front of the column, or if the force was in touch with the enemy, with the commander of the force with the leading armored cars. With a common thrust line, which was quickly laid, a rapid rate of advance was maintained, the whole force moving in groups like beads on a thread. Errors of direction in wide, featureless country such as the desert, where maps are inaccurate, must be expected and do occur. At night, when the column halted and closed up, the navigator fixed our position to within 100 yards by stellar observation with his theodolite, and the thrust line for the next move was then adjusted. This method of moving proved fast and flexible. Each vehicle in every formation kept its same relative position at all times. The headquarters vehicle was the center of each group and the layout soon became familiar to all drivers.



After traveling along the road or through a defile where open formation was temporarily lost, the first opportunity was taken to shake out again. In the desert in this formation, eight to ten miles in the hour was averaged in daylight and four to six miles in the hour, traveling along a lit route, at night. Over good going in the desert, the force could move a hundred miles a day for several days on end, or thirty miles a night.

In these deep penetrations behind the ene-

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my lines, long flanks were inevitably exposed to the enemy. The responsibility for flank protection must not be permitted to weigh too heavily on the commander or deflect him from his main objective. He must rely upon speed and the violence of his thrust. In the event of an enemy attack, formations were responsible for their own protection.

The move in was timed so that there would be as much daylight as possible after the capture of the objectives. We moved in, therefore, to strike as soon after dawn as possible. The commander in his armored tactical headquarters moved at the head of the column behind the cavalry screen with his C. R. A., divisional cavalry commander, and armored brigade commander just in rear. Once contact was made, the big decision had to be taken where and when was the armor to be deployed? This depended on the enemy mobile reserves which had to be pinned while the gun group and infantry brigades maneuvered, and a gun-line was put out to form a firm base. The object was always to fight the enemy armor inside the area covered by the whole weight of the medium and field artillery. Where our tactics differed from those of our German counterpart, the Panzer Army under Rommel, was that they put down their infantry and maneuvered with their armor. We struck with our armor and continued to maneuver our infantry as the battle progressed.

Let me conclude this article with a short account of the left hook which turned the Mareth Line. The Army plan was to carry out a two-pronged attack involving a frontal assault on the Mareth defenses and an outflanking movement through the desert sixty miles to the south. (See sketch.) For this latter operation the force known as the "New Zealand Corps" was formed, consisting of the New Zealand Division (including the British 8th Armored Brigade), the King's Dragoon Guards, British medium field and antitank artillery regiments, and General Leclerc's Fighting French Forces. The British 8th Armored Brigade, armed with Sherman and Crusader tanks, was the armored component of the New Zealand Division.

In view of the number of left hooks we had already carried out, it was not expected that another would achieve tactical or strategic surprise, in the accepted sense. We planned, however, to gain an element of surprise by the speed of our move and the sudden violence of our attack.

On 11 March, the New Zealand Corps began to assemble sixty miles south of the Mareth Line. As usual, our move was secret; we moved by night with wireless silence and with all badges and divisional signs removed. Assembly involved some 6,000 vehicles and 27,000 men. We were self-contained with eleven days' food, water, and ammunition, and petrol for 350 miles. The move to assembly position, which took a week, was completed by the 18th. Weeks of careful study of the ground from air photographs and patrol reports and long detailed planning culminated in the explanation of the operation to all officers and noncommissioned officers on a plaster relief model of the area over which we were to fight.

On the night of 19 March we moved in close desert formation up to the line reached by General Leclerc's Free French Forces. We intended to lie up dispersed next day and advance by night to gain contact with enemy reconnaissance units in front of his position. This would have coincided with General Montgomery's frontal assault on the Mareth Line. It became clear, however, that enemy low-flying tactical reconnaissance aircraft would discover our presence early next morning and it was decided, therefore, to rob the enemy of several hours by moving in daylight and, relying entirely on speed, to race forward by daylight for the Tebaga Gap. This we did, and on the afternoon of the 21st we squared up to the enemy position covering Point 201, registering the artillery before dusk. At ten o'clock the same night the 6th New Zealand Infantry Brigade attacked and captured Point 201. By dawn the Sherman tanks of the 8th Armored Brigade were up behind the crest. A few hours later the German 21st Panzer Division and the 164th Division came up to hold the gap and Point 201 which they always looked on as

the key to the back door of the Mareth Line, but they arrived eight hours too late. As it was, the enemy counterattacked strongly with infantry and tanks, but Point 201 was securely held. We had gained a foothold for the "blitz" attack of 26 March when New Zealand infantry and the tanks of the 8th British Armored Brigade broke through and made the gap for the 1st British Armored Division to exploit towards Hamma.

The left hook round the Mareth Line was a perfect example of strategic surprise being gained by mobility. As a result of training and experience, our force was able to advance over country which was considered impassable, gain contact, deploy its gun group in three hours, and carry out an attack by moonlight against a prepared position covered by a minefield and a tank ditch.

This combination of lorry-borne infantry and armor in the division, with its mobility and hitting power, is a new and powerful strategic weapon of the British Army. Wherever the theater of war, gaps will eventually be made in defenses, flanks will appear, or there will be soft spots to attack. It is then that the mobile striking force can, by speed and daring, make a surprise appearance on the battlefield which may well prove decisive.

Fighting Enemy Mortars

Translated and digested at the Command and General Staff School from a Russian article by Major A. Gembeev and Major N. Polonski in *Krasnaya Zvezda* (Red Star) 10 March 1944.

MORTAR fire is one of the basic elements of German defense. The development of effective methods of fighting enemy mortars, therefore, becames extremely important during offensive operations.

Countermortar activities fall into three closely related phases: reconnaissance, systematization and analysis of reconnaissance data, and organization of fires for neutralization or destruction of enemy mortar groups. It should be stressed that only close cooperation among all reconnaissance agencies and units assigned to fight enemy mortars will produce the desired results.

Detection of enemy mortar batteries is difficult because of the tactical and technical peculiarities of the weapon. Among these peculiarities are the feeble report of the weapon, difficulties in spotting a firing mortar, and concealed disposition of mortar batteries.

Three reconnaissance methods are used in locating the mortars: optical methods, aerial photography, and visual observation. It would be difficult to say which method is most effective, for the selection of the method depends upon the phase of the battle and the terrain.

When the front line is stabilized and especially when it passes through a wooded area, sound and flash ranging will be the principal method of reconnaissance. In mobile warfare, when the intensity of artillery and mortar fires on both sides is high, it is advisable to shift to optical and visual reconnaissance, using the sound method during the period of comparative lull. This does not mean that under certain conditions only one method of reconnaissance should be used. On the contrary, all methods should be employed simultaneously as far as possible. Battle experience shows, for example, that it is advisable to use simultaneously optical reconnaissance posts equipped with transits and posts working with stereoscopic telescopes. This facilitates the location of targets and the determination of their coordinates. Aerial photography, which is the most accurate type of reconnaissance, serves as a check and supplements the other methods. Aerial photographs, however, may be used extensively only when their data have been confirmed by visual and sound reconnaissance. Otherwise, dummy and unoccupied firing positions may be mistaken for real targets.

In mobile warfare, when it is difficult to

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determine the precise coordinates of active targets, one should determine a comparatively small area within the limits of which a given target is located. Firing at this area will neutralize an enemy battery or a separate mortar.

In optical reconnaissance, it is advisable to divide the zone of reconnaissance into separate sectors. The personnel of the post should study thoroughly all the sectors, and especially those sectors where mortar batteries are most likely to be located. To save time, optical reconnaissance data should be worked out by graphical methods, with an occasional computation check-up.

The comparison of the results of the various types of reconnaissance helps in determining the true geographic coordinates of the targets, the number of enemy mortars and their caliber, the location of alternate and dummy firing positions, and the location of roving mortars. In analyzing the reconnaissance data, the staff should note the time of detection of each target, its observability, how detected, character of installation, activity, method of firing, sector of fire, and degree of authenticity of the data. Systematization of this information will enable the staff to determine the areas occupied by enemy batteries, ammunition dumps and ammunition routes of supply, observation posts, and the location of trenches for crews. It will also uncover the tactical grouping and the number of mortars within a given infantry unit and the grouping and composition of special reinforcing units.

Special attention should be paid to locating roving targets. It is quite obvious that this requires a continuous study of their fires as to the time of activity, sectors of fire, and firing methods. Aerial photography may be very helpful in detecting roving targets when it is carried out for this very purpose and according to a specially prepared plan.

If all the agencies of artillery reconnaissance work continuously and conscientiously and the staffs constantly and thoroughly study all the data on mortar batteries, then a good half of the work pertaining to locating the mortars is done. But it is not sufficient to have even the most reliable reconnaissance data. It is still necessary to use correctly the firing weapons assigned to combat enemy mortars, to select the most harmful targets for neutralization fires, and to employ the most advantageous firing methods. All the men of the fire units should be prepared in advance for this type of action.

Depending on the situation, the number and character of the weapons involved, and the amount of ammunition available, the artillery units engaged in fighting mortars will be given the following missions:

a. Planned neutralization or destruction of separate active targets under conditions of a stabilized front.

b. Planned neutralization or destruction of separate targets and mortar groups during the period of artillery preparation.

c. Systematic neutralization or destruction of separate roving targets coming to life again after having been silenced by our artillery preparation, and interfering with the advance of our infantry.

It should also be remembered that fire action is not limited to firing at mortar batteries. One should also anticipate firing at observation posts, ammunition dumps, shelters for the crews, etc.

The selection of the method of firing depends on the nature of the mission and the situation. For example, the neutralization of separate targets during a period of comparative lull is effected by sound reconnaissance. If the element of surprise is desired, it is advisable to use a different sound check point in the adjustment of fire, from which fire is later transferred to the target.

During the artillery preparation, all the reconnoitered targets should be taken under fire. After the infantry has launched the assault, fire is conducted on all targets showing fire activity and especially on roving mortar batteries.

In placing concentrations on areas occupied by mortar batteries, three settings of the elevation scale should be used for each area (increasing or decreasing range by one di-

vision of the elevation scale). If mortars are used for neutralization fires, it is advisable, due to dispersion, to conduct concentrated fires with converging sheaf and using previously determined settings of the elevation scale.

For combatting enemy mortars, 122-mm howitzer batteries and 120-mm mortar batteries are best.

Some Thoughts on Combined Operations

Digested at the Command and General Staff School from an article by Group Captain E. L. Tomkinson in *The Journal of the United Service Institution of India* April 1944.

WE MAY define combined operations as amphibious warfare requiring the tactical employment of the forces of all three services in conjunction, generally necessitating the conveyance of troops by sea and air.

For the Royal Navy a combined operation only differs from its normal function in that for the smaller craft it is a coastal, as opposed to a deep water operation, often fraught with great navigational difficulties. Bombardment and supporting fire are also required against land targets.

For the Royal Air Force the difference between a combined operation and its normal functions is less; to provide air cover and support over the place of landing calls for no major alteration in technique, except for communications, different from that provided for the protection and support of an army advancing upon land or of a fleet or convoy.

But for the Army the combined operation is a peculiarity. The approach march is carried out for it by the Navy, or by the Air Force in the case of airborne troops, and the assault is made from sea-going landing craft of various types. There must be no pause to take a deep breath upon arrival at the beach or to "consolidate the position"; all must press on to their objectives.

The choice of place for the landing and the selection of the objectives clearly become an inter-service matter. To be successful there must be welded together a well balanced force of all arms calculated to achieve the immediate aim with concentration and economy of force.

Here, then, is the crux of the whole matter —the *plan*. Since this plan has to be worked out by all three services, it is much more difficult to achieve than one produced by an individual service. Forbearance and understanding of each other's capabilities and limitations are essential to avoid heartburning and friction. Compromise there must always be, but the compromise must not be such as to jeopardize the whole assault.

We can ask ourselves three questions:

How can we strike?
Where can we strike?
How do we strike?

Taking the first question, the inter-service planning staffs of the Allies are always studying this answer, at various levels. We can only strike from the land if we are firmly established ashore. Example—Egypt and Tunisia. From the air we generally can strike always, provided we have secure bases from which to operate aircraft. We can strike from the sea nearly always, and the battle of sea communications always continues, but there may be times when new bases are required.

Any of the above methods of attacking the enemy, therefore, may require a combined operation, in order to aid in the general existing offensive or to seize a new base from which naval and air forces can operate at longer range than before. Or it may be necessary to deny such a base to the enemy.

Further, since no successful operation of war can now be carried out without air superiority, it will often be necessary to conduct a preliminary combined operation in order to be able to provide that air superiority in the main offensive.

The step-by-step policy of Japan in the Southwest Pacific is a perfect example of the

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latter need. Numerous big and little combined operations were executed in order to establish air bases on the flanks, from which aircraft, step by step, gave local air superiority and support, and to a large extent gave command of the sea as well, to the main offensive, which was against Malaya, Java, and probably Australia in the original plan.

From the above arguments we may deduce that combined operations are therefore a means to an end, and rarely an end in themselves. This end may be a primarily naval, military, or air one.

This is an important point, and failure to appreciate it may lead at best to delay, at worst to danger, if parochially-minded commanders forget the object of the assault, and try to hold on to their forces after the assault is successful.

The necessity of carrying out a combined operation having been decided on the highest level, we come to the second and third of our questions: Where can we strike? and How do we strike? This is where we hear of the Combined Operations Plan for the first time.

The organization of a combined operation, the marshalling, loading, and sailing of the hundreds of ships and craft, is a most intricate operation of war. Success or failure will depend upon good planning, which must be operational and administrative; the two are complementary. The background of a good combined operation is a wise operational and administrative plan, prepared by all three services working together from the outset.

The approval of the Supreme Commander and the War Cabinet having been given to a combined operation, the Joint Planning Staff on a lower level will investigate the answer to our second question: "Where can we strike?" This becomes the outline plan, and has to be approved by the Supreme Commander, and, in most cases, London and Washington, because there are political reactions and overriding factors which will invariably mean some modifications between what resources those within a particular theater of war deem desirable, and those resources which the higher level planners, who have the broadest picture of the whole world war before them, deem to be essential and available.

Meantime, the task force commanders are appointed with their planners, so that as soon as the outline plan has been approved no time should be lost when the plan is passed to them.

The force commanders argue and adjust the plan to their conception of how best to achieve their aim, and state the minimum requirements of all forces, shipping, landing craft, and equipment; in other words, a well balanced force most suitable for the particular conditions of coast and terrain to be met, and for the opposition likely to be encountered.

When this has all been agreed in general, the force commanders' plan is produced in great detail. Thus the answer to our third question, "How do we strike?" is answered. When completed, the plan is passed to the assault commanders, who in their turn make their plans. And so on down the scale.

An important principle in combined operations is that planning should be downwards, on successive levels, each plan dovetailing into the other, and each in a little more detail. The intention of the commanders must be clearly seen in every plan as a scarlet thread woven into a length of homespun. Thus initiative is kept alive, and the junior NCO, finding himself alone with a handful of men, will know what to do.

Like any other operation of war, there are many essentials for the successful execution of an assault by sea which are common to all warfare. It would be redundant to mention them here; there is no "Black Magic" required because a sailor, soldier, and airman have to work together in more intimate touch than is required when each is engaged in operations peculiar to his own service. Nevertheless, there are a number of special requirements for the successful combined operation which the soldier or sailor, and to a lesser extent the airman, new to this form of warfare, may not appreciate. Some of the more important of these are as follows:

Shipping.
Landing craft.
The right weapons for the particular assault.
The proportion of seaborne and airborne troops in the assault build-up and follow-up formations.
Specialist equipment in the assault.
Specialist training for the assault.
Loading of ships and craft.

We may deal with these points in more detail:

The provision of shipping must conform to world requirements, and its allotment has to be made from home; the special assault ships (LSI: landing ships, infantry) may not be available in the numbers asked for, so that other vessels will have to be used. Similarly, the full numbers of MT [motor transport] ships may not be provided, so that more LST's (landing ships, tank) may have to be asked for.

As regards the landing craft, which are specialist types, the number and type will be governed by the depth of water, the nature of the beaches, and the quantity and type of heavy equipment to be landed. For example, it is no good the army force commander asking for large quantities of AFV's [armored fighting vehicles] in the first flight of the assault if, upon investigation, the naval commander finds that he cannot land them in sufficient quantity in sufficient time because of navigational obstructions or the wrong slope of beach. The decision to employ airborne troops will depend upon the ability of the air force to convey them in safety, however much the army may want to use them.

And, above all, in any plan it must be the air force commander who has the final say whether he can provide the requisite air cover and support to enable the assault to be carried out at all.

As regards specialist equipment, there will be the usual tussle between the expert who wants all his patent gadgets taken ashore as early as possible, and the task force commander who knows that in the ultimate battle it is the artillery and the soldier with his rifle who will be the winning factor enabling advance on shore. Ships have not got elastic sides, so that every ton of space taken up by special equipment is one less ton for the fighting soldier. Here, as always, there must be compromise, for it is no good landing vast quantities of bridging material or mine-destruction apparatus to aid the assaulting troops if thereby there will be inadequate numbers of troops for the assault.

Specialist training is essential for officers and men of all services who may take part in the assault. The soldier and airman of the ground staff (as opposed to the aircrew) are moving in a different element. Although it sounds trivial, yet it is a fact that an initial surprise landing can be made or marred by the way a battalion can speedily and silently get into their landing craft in the dark without tripping over ring bolts or other excrescences that await the unwary on a heaving deck.

The problem of loading the ships and landing craft is of great importance. It must be arranged in the greatest detail, and once fixed should never be changed. The principle should be "A place for everything and everything in its place," i.e., tactical stowage, and not like the old naval definition of a midshipman's sea-chest—"Everything on top and nothing handy."

Finally, once the assault has been successful and the bridgehead established ashore, the role of the specially-trained assault troops, landing-craft crews, and airmen is over, for other formations pass through them to continue the battle on land.

The "combined operators" should be withdrawn, and made ready once again for the "next time."

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Tank Battles Near Warsaw

Translated at the Command and General Staff School from a German article by Major J. Schäfer in *Berliner Börsen-Zeitung* 18 August 1944.

DURING the course of his offensives, which he began on 18 July at Kovel (southeast of Brest Litovsk), the enemy advanced in two main directions after crossing the Bug. The northern thrust was aimed at Siedlce, which at the same time was intended as the objective of the spearhead driving forward in a southwesterly direction from the Bialowiez forest. The wide, double encirclement of Brest Litovsk and of the forces fighting in this area, aimed at by these operations, came to naught, however, in the face of the German countermeasures. In addition to the operation aimed at Siedlce from the southeast, there was another one in progress farther south by means of which the speedy attainment of two objectives of great tactical and

operational importance was hoped for: viz. (1) the seizing of the Vistula bend in the Kazimierz-Pulawy-Deblin area in order to gain possession of the river crossings here, and (2) the outflanking of Warsaw on the north. In the attempt to gain quick possession of Warsaw by means of a double enveloping movement, political considerations also probably played a role. It was desired to be able to display the conquered Polish capital to the "Polish Liberation Committee" that had been set up by the Bolsheviks and at the same time to maintain a pressure on the chairman of the London Exile Government who was then in Moscow. The rapid victory aimed at by the Bolshevik command was thwarted, however, by quick action on the part of the German command and by bravery and skill on the part of the troops.

When portions of a Soviet mechanized army by a surprise attack attempted to seize possession of Deblin (on the east bank of the Vistula), they were hurled back with a loss of thirty tanks. The enemy saw himself forced, therefore, to begin a systematic battle for the Vistula crossings, in which German antiaircraft artillery played a decisive part in the defensive action. Strong enemy armored forces, headed northward along the river, pressed the rapidly formed Warsaw bridgehead back in violently conducted action, crossed the railway line and the Warsaw-Siedlce highway thirty-three kilometers east of Warsaw on 30 July, and having passed Volomin, reached the city of Radzymin (about twenty kilometers northeast of Warsaw), at the same time blocking the important railway and highway leading to the northeast. If this thrust had led to the attainment of further objectives, there would have existed not only the threat of an envelopment from the north but a simultaneous threat to the rear of the German forces maintaining their positions farther to the east in the Siedlce-Bug-Bialostok area. The enemy rushed in powerful forces, having at his disposal for this purpose formations that had been freed after the conclusion of the fighting at Brest Litovsk.

In order to escape the dangers arising from the thrust of the Bolshevik mechanized forces into the Volomin-Radzymin area, various measures had to be taken, and these were carried out by the troops as rapidly as they were ordered by the command. Since, in a war of movement, armored forces can be effectively combatted by armored units only, im-

portant and fruitful assignments again fell to the lot of the armored formations of both army and Elite Guard.

The enemy was naturally anxious to maintain, at all costs, possession of the positions he had seized and to organize them still better. Consequently, in the area east, but more particularly northeast, of Warsaw, there developed a tank battle which lasted several days and which ended with the destruction of the Soviet 3d Armored Corps. Our problem was to close the gap between the Warsaw bridgehead and the front farther to the east, thereby cutting the connection with the rear for the enemy tanks driving northward, and to annihilate the unit itself. This problem was solved in heavy fighting on 1 August by means of armored attacks on the part of the army and Elite Guard, directed eastward from the west and westward from the east. Both armored spearheads met at Okuniev. During these hard-fought battles, the attacks of the German armored divisions and of the Herman Göring Armored Parachute Division brought about the destruction of the enemy armored unit, which, moreover, had been favored by the terrain.

The Okuniev-Volomin-Radzymin area is characterized by several small streams, marshy areas, thickets, and dune-like eminences. The enemy made use of the advantages offered by this terrain and delivered his fire from well protected and concealed tank positions. When, after some preliminary fighting, Radzymin was captured on 2 August by means of concentric attacks from the southwest and northeast—in which numerous enemy tanks were destroyed—the attack was carried on the following day from several sides to the wide-spreading city of Volomin. In a narrow area, seventy-six more enemy tanks were knocked out in and about Volomin. There developed a sort of bush fighting between the heavy steel colossi—often at very close range—in which it was a matter of who shot first and straightest. Our soldiers showed themselves in this case, also, as the superior fighters. Of course, the hard tank battles could not be fought without some loss on our part. But the enemy's losses were incomparably greater. The highways cut to pieces by the tank tracks, the uprooted trees, and the great numbers of wrecked Bolshevik tanks testify to the intensity of the fighting and the German success.

After the mass of the enemy tanks had been destroyed on 3 August, the battle was continued on the following day in the vicinity of Okuniev, in the course of which the enemy not only defended himself stubbornly with armored and antitank forces, mortars, and multibarreled rocket guns, but, as also farther to the east, repeated his counterthrusts and attacks. During the four-day tank battle, 189 enemy tanks were destroyed and three assault guns and forty-five other pieces captured. By the destruction of the 3d Armored Corps, the enemy's intended breakthrough was frustrated and, consequently, the outflanking operation around the north side of Warsaw and the threat to the rear of the German units further eastward was eliminated. The first phase of this fighting about Warsaw, in which the enemy had aimed at a quick attainment of his objectives by making use of the element of surprise, resulted in complete failure for the Russians.

Tank Wedges

Translated and digested at the Command and General Staff School from a Russian article by Lieutenant Colonel P. Kolomeitzev in *Krasnaya Zvezda* (Red Star).

Our combat experience is rich in examples of wedging of tank units into enemy defenses. Some were successful, some failed, but in either case they merit equal consideration. Only by comparative analysis of both types of operations may one come to more or less objective conclusions. For this purpose, we shall first discuss an instructive

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example of a rather unsuccessful operation and, taking this as a basis, try to establish the fundamental tactical principles of "tank wedges."

It is well known that an offensive operation cannot continue forever. Sooner or later there comes a moment when a certain equilibrium of forces is established on the entire front or in the direction of the main effort. The enemy has brought up reinforcements and recovered from the blows, while the attackers feel the growing necessity of consolidating their gains, reinforcing their units, etc. There comes an operational pause the length of which depends on the situation and on the ability of the attacking side to prepare itself rapidly for the continuation of the offensive.

Such was the situation when the N-th tank unit was ordered to breach a German defensive zone running along a river and previously prepared for defense. The enemy had been reinforced, while our unit was exhausted after days of battle.

Tanks and motorized infantry supported by artillery effected a breakthrough of the German line on a narrow front and wedged into the German position to a depth of twenty-five kilometers. The breach made by the tanks was not exploited in time, and the enemy managed to close it. The unit, isolated and without support, was forced to withdraw, but the withdrawal was not executed without certain complications. It should be noted that during all this time the situation in the adjacent sectors of the front remained stabilized.

This example is instructive in many respects. Wedging-in is always connected with a certain risk, which should by no means serve as an excuse for inactivity. But the tactics of wedging are based on definite rules, and they must be reckoned with.

Most conspicuous in our example is the isolation of the mechanized unit. This isolation was complete. In the first place, the tank attack was not supported and reinforced from the depth of our position; on the other hand, the operation was not coordinated with other activities on the front, such as secondary attacks on adjacent sectors. As a result, the enemy was able to concentrate his mobile reserves and close the breach. The fact that the depth of the operation was out of proportion to the forces available, and the generally unfavorable situation (the offensive was on the wane), also contributed to the failure of the unit.

This allows us to formulate the following basic conclusions: *the wedging of tanks into enemy positions should be coordinated with the general activity of the troops in the given sector of the front, and undertaken only when their operations are definitely of an offensive nature.* This contention is confirmed by many operations of the present war.

When the operations of our troops at Stalingrad were still limited to active defense, we seldom succeeded in wedging into enemy positions although such attempts were made. But when our troops started to advance, many tank wedges were driven into the enemy lines. A more recent example is the Kiev operation accompanied by a deep wedging-in of our tank troops. Here it was possible because the activity of our tanks was closely coordinated with the operations of other units. All the operations of our forces and weapons were decisive and strictly coordinated in time and space. Compare this with the example mentioned in the beginning of this article. There the tank wedge was weak, and it was also deprived of the determined support of other troops operating in that sector. Without this, wedging-in involves considerable risk, and there is no hope of its being effective.

A very important and interesting problem is securing the stability of deep wedges. Let us take as an example the breakthrough of our tank units southwest of Kremenchug (October 1943). First of all, there was a swift maneuver on the part of the tank group assigned to break through the enemy lines. Possessing a sufficient breaching power, this group within two days drove a wedge of more than a hundred kilometers into the enemy lines. Stunned by the suddenness of the attack, the enemy was not able until the third

day to commit his mobile reserves, which were located in the vicinity. Using several tank divisions, the enemy delivered several concentric attacks. The Germans succeeded only in pressing back our tank units at the tip of the wedge, but the wedge as a whole remained intact. The first blows of the enemy mobile reserves fell on our tank units, but soon both our infantry and artillery were committed, and the wedge was strengthened.

The stability of the wedge was thus secured not only by the rapidity of the tank maneuver but also by a quick *saturation of the wedge with massed infantry and artillery.* Let us see why this is so important.

It is rather difficult for the artillery and infantry to move close to the advancing tank and motorized units penetrating deep into the enemy territory. But it is not always advisable to limit the mobility of the tanks by the slow tempo of the infantry. If the tank group is strong enough it may operate for some time all by itself. But when enemy operational reserves are expected to be committed, the gap between the tank group and the main infantry and artillery forces should be eliminated. Experience shows that enemy operational reserves do not appear in the breakthrough area before the second or third day. It is desirable that by this time our tanks achieve a decisive success and be supported by the infantry and particularly by the artillery.

The stability of a wedge is determined not only by the density of its saturation by troops. There were cases when such wedges were easily cut off only because they were weak in their most vulnerable spot—at the base. It is interesting to note that during the last year the German tactics of "cutting off" wedges at their bases have failed. This proves that our commanders have acquired skill in using the tactics of deep penetration. They wedge into enemy defenses and at the same time take energetic measures to expand the wedge. With what astounding speed was widened the wedge driven by our troops into the enemy defenses after the capture of Kiev!

The energetic extension of the wedge at its base is probably the most effective method of neutralizing enemy counter-blows. This is particularly important when the wedging-in, for some reason or other, cannot be completed, and the front becomes stabilized for a certain time. Generally speaking, such "stabilized" wedges are disadvantageous. They lengthen the front line without increasing its stability. The primary task of the attacking troops is in the immediate exploitation of the advantages created by the breakthrough. The strength of a wedge lies in the uninterrupted action of the troops.

The depth of a wedge is determined by the situation and particularly by the correlation of forces. If the enemy has a strong tank group in the vicinity of the wedge, deep tank blows should be used with caution. In such cases, the main attack should be launched by the combined forces of mechanized infantry and artillery units, and the participating units should not be separated from each other. When the enemy mobile group is defeated, the action of the tanks may become more independent. But even in this case the infantry should constantly exploit the success attained by the tanks.

There are different forms of tank wedges. The most effective type of wedge is the one driven along two converging directions—the so-called "pincers," extensively used for encircling isolated enemy groups. In order to grip the enemy into their deadly jaws, the pincers must be strong enough and, what is most important, must possess high mobility. All depends here on speed and surprise.

Parallel wedges are justified in an attack conducted on a wide front. They allow of splitting the enemy front and of smashing it part by part. Parallel wedges should finally be turned into multiple pincers resulting in the encirclement of isolated enemy groups. The leading role here is taken by tanks. Their maneuver should be bold but strictly coordinated with the operations of the infantry and artillery. And it is up to the infantry and artillery units to wipe out enemy centers of resistance isolated by the tanks.

The maneuver of the tanks in driving a

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wedge should be flexible and swift. Frequently the situation itself will suggest where to direct the point of the wedge in order to strike a deadly blow at the enemy's heart. The tank wedge should be the beginning of a complete rout of the enemy group.

A Twenty-Four Mile Swim

From *The Times Weekly Edition* (London) 11 October 1944.

OUR special correspondent in the Nijmegen Salient gave details of a German attempt on the night of 28 September to destroy the railway and road bridges spanning the River Waal and to cut communications between the British troops fighting north of the river and the supply areas south of it. He had been allowed to see ten survivors of the German wrecking party who were still wearing the fantastic equipment in which they swam seventeen and a half miles down the Waal, then six and a quarter miles back in the teeth of an eight-knot current.

Their effort came dangerously near success. The men chosen for the task were all fine physical specimens. One was the German champion swimmer, another had swum in the Olympic Games. They spent three months training in Venice for a task such as this. Twelve, all noncommissioned officers, were assigned to attack the bridges. They entered the Waal seventeen and a half miles above Nijmegen. They had three floating charges of the powerful high explosive Hexanite, each like a twin torpedo. They wore rubber skullcaps, rubber skin-tight suits, and tight-laced overalls, their rubber boots were fitted with paddle-shaped rubber flaps about two feet long, which enabled them to cut through the water at a speed impossible to the unaided swimmer. They were also equipped with rubber masks connected with oxygen flasks. These masks fitted over their mouths, enabling the wearers to swim long distances under the water.

They guided the charges down the river without difficulty. They swam on with their charges, then split up into three parties. One party with one charge made for the railway bridge, two other parties with two charges paddled up to the road bridge. The strength of the current really saved the road bridge from destruction, as the men were unable to wrestle the charges into the prescribed position because of the pressure of the current. Otherwise there is little doubt that the bridge would have been made useless. Each charge was equipped with a time fuze, which allowed ample time for the men to put several miles between themselves and the bridges before the explosion, but here they made the error which led to their capture. They turned round and swam upstream against the current instead of swimming with the aid of the current downstream. After covering six and a quarter miles exhaustion compelled them to seek rest in the shallows near the bank. British soldiers saw them and opened fire, killing one and wounding another, who died later from the effects of the wound combined with exposure.

The courage of a British naval lieutenant possibly saved the road bridge. He stripped to his underpants and dived in after the first charge had exploded and explored the pier supporting the bridge until he found the second charge, which was hauled out and disarmed a few seconds before it was timed to explode.

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